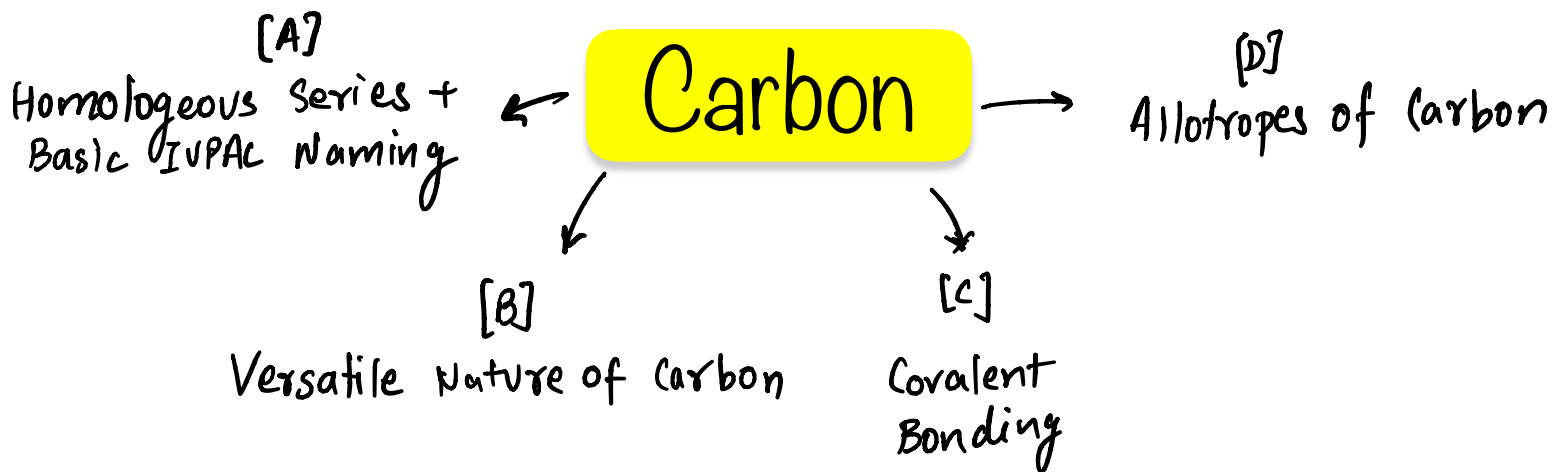




# **CLASS 10 SCIENCE**

**PREVIOUS YEAR  
CHAPTERWISE/TOPICWISE  
ANALYSIS**

**SHOBHIT NIRWAN**



### [A]

Q. What is the difference in the molecular formula of any two consecutive members of a homologous series of organic compounds? [CBSE 2008]

Ans The molecular formula of any two consecutive members of homologous series differ by  $\text{CH}_2$  units.

Q. Write the molecular formula of the 2nd and 3rd member of the homologous series where the first member is ethyne. [CBSE 2017]

Ans . The molecular formula of the 2nd and 3rd members of a homologous series where the first member is ethyne ( $\text{C}_2\text{H}_2$ ) is formed by adding- $\text{CH}_2$ -:

2nd member of alkyne series = propyne ( $\text{C}_3\text{H}_4$ )  $\text{CH}_3\text{-CH}_2\text{-C(triple bond)CH}$

3rd member of alkyne series = butyne ( $\text{C}_4\text{H}_6$ )  $\text{CH}_3\text{-CH}_2\text{-C(triple bond)CH}_2\text{-CH}_3$

Q. Write the name and formula of the 2nd member of the series of carbon compounds whose general formula is  $\text{C}_n\text{H}_{2n}$ . [CBSE 2012]

Ans .  $\text{C}_3\text{H}_6$ -----> Formula

$\text{H}_2\text{C=CH-CH}_3$ -----> Structure

Propene is the second member of the series whose general formula is  $\text{C}_n\text{H}_{2n}$ .

Q Write the molecular formula of 2<sup>nd</sup> and 3<sup>rd</sup> member of the homologous series whose first member is methane. [CBSE 2017]

Ans. 2nd member Ethane  $\text{C}_2\text{H}_6$

3rd member Propane  $\text{C}_3\text{H}_8$

### [B]

Q. Which element exhibits the property of catenation to maximum extent and why? [CBSE 2016]

Ans. Carbon exhibits the property of catenation due to its strong C-C bond.

Q. State the reason why carbon can neither form  $\text{C}_4^+$  cations nor  $\text{C}_4^-$  anions but forms covalent compounds. Also, state reasons to explain why covalent compounds:

(i) are bad conductors of electricity?

(ii) have low melting and boiling points? [CBSE Compt. 2017, CBSE 2019]

Ans. The atomic number of Carbon is 6 with an electronic configuration of 2, 4. Hence, carbon has 4 electrons in its valence shell. Carbon can lose or gain 4 electrons in order to gain stability. It cannot gain four electrons as carbon atom having 6 protons is very small to

handle 10 electrons and it cannot donate electrons as it needs a lot of energy to do so. Hence, it cannot form  $C4^{+}$  anion or  $C4^{-}$  anion and thus forms a covalent bond.

1. Covalent compounds are formed by sharing of electrons. They don't have a free electron that is required for electricity transfer (electricity is the flow of free electrons), thus they are bad conductors.

2. Covalent compounds have low melting and boiling points because they have weak intermolecular forces between bonds. Hence, less energy/temperature is needed to break the bonds.

Q Carbon a member of group 14, forms a large number of carbon compounds estimated to be about three million. Why is this property not exhibited by other elements of this group? [CBSE 2020]

Ans. This property of carbon is known as catenation which is exhibited only carbon atom, not by other elements of this group. Due to the small size of carbon atoms, stability of carbon atoms and ability to form strong bonds, carbon gives rise to a large number of compounds linked to each other.

Q. (a) Why are most carbon compounds poor conductors of electricity?

(b) Write the name and structure of a saturated compound in which the carbon atoms are arranged in a ring. Give the number of single bonds present in this compound. [CBSE 2018]

Ans. a) Electricity is conducted by moving electrons. But carbon forms covalent bonds by sharing electrons. Hence, it does not have free electrons.

(b) Cyclohexane is a saturated compound in which carbon atoms are arranged in a ring. 6 single bonds are present in this compound.

[C]

Q. Draw the electron dot structure of Nitrogen molecule [CBSE 2012, 2013]

Ans. This is the electron dot structure of nitrogen molecule.

Q. Ethane, with the molecular formula  $C_2H_6$  has

a). 6 covalent bonds

b). 7 covalent bonds

c). 8 covalent bonds

d). 9 covalent bonds

Ans. b). 7 covalent bonds

Q. (a) Explain why carbon forms covalent bond? Give two reasons for carbon forming a large number of compounds.

(b) Explain the formation of ammonia molecules.

Ans.

(a). The atomic number of Carbon is 6 with an electronic configuration of 2, 4. Hence, carbon has 4 electrons in its valence shell. Carbon can lose or gain 4 electrons in order to gain stability. It cannot gain four electrons as a carbon atom having 6 protons is very small to handle 10 electrons and it cannot donate electrons as it needs a lot of energy to do so. Hence, it cannot form  $C4^{+}$  anion or  $C4^{-}$  anion and thus forms a covalent bond.

(b). Ammonia ( $NH_3$ ) is made up of one atom of nitrogen and three atoms of hydrogen

Atomic number of N = 7

Electronic configuration = 2, 5

Atomic number of H = 1

Electronic configuration: = 1

So hydrogen needs 1 more electron to complete its duplet and nitrogen needs three more electrons to complete its octet. Hence three hydrogen atoms will combine with nitrogen to form ammonia.

**[D]**

Q. Give reasons for the following: [CBSE 2011]

(i) Element carbon forms compounds mainly by covalent bonding.

(ii) Diamond has a high melting point.

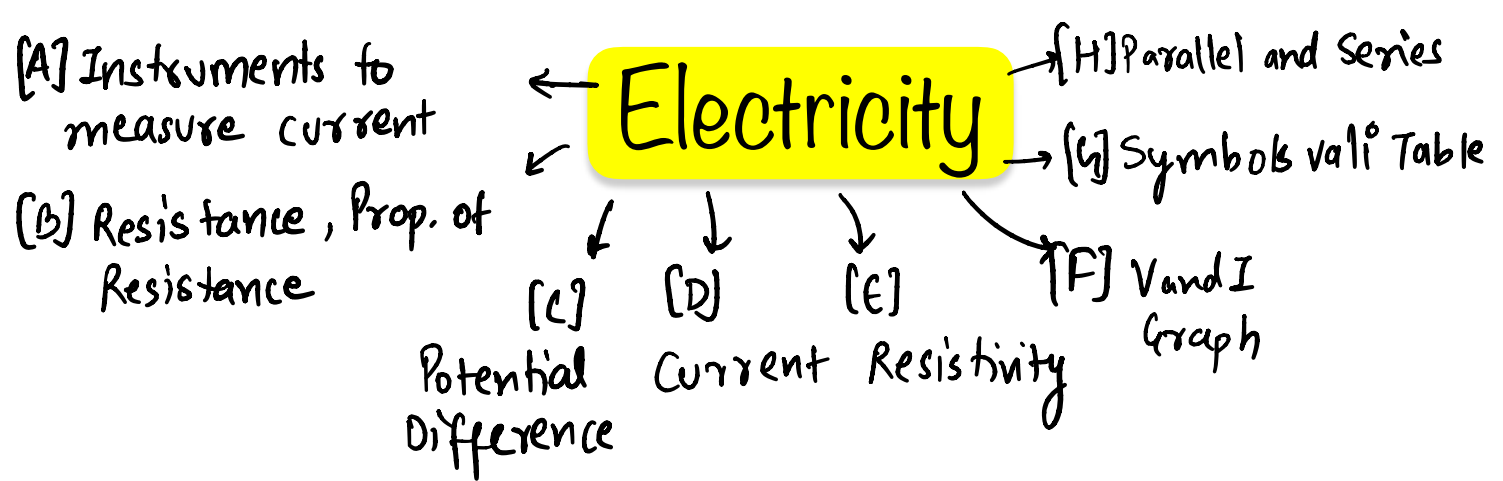
(iii) Graphite is a good conductor of electricity.

Ans. (i) It is because carbon has four valence electrons, it cannot gain or lose four electrons because high energy is needed. It can only share four electrons.

(ii) It is due to strong covalent bonds and compact structure of diamond.

(iii) It is due to presence of free electrons in graphite because each carbon is linked to three more carbon atoms.

Shobhit Nirwan



- [I] Joule's law of Heating
- [J] MCB, fuse etc vala topic
- [K] Mixed Concept Question

Q. What is the function of a galvanometer in a circuit? [1 M, 2019]

Ans. The function of a galvanometer in a circuit is to detect the presence of electric current in a circuit.

Q. What would you suggest to a student if while performing an experiment he finds that the pointer/ needle of the ammeter and voltmeter do not coincide with the zero marks on the scales when circuit is open? No extra ammeter/ voltmeter is available in the laboratory. [2M, 2019]

Ans. If the pointer is above the zero mark, the zero error is negative. The number of division it is above the zero mark are to be subtracted from reading. If the pointer is below zero mark, the zero error is positive. The number of division it is below the zero mark are to be added to reading.

Q. How are voltmeter and ammeter connected in a circuit? [2M, 2017]

Ans. The voltmeter is connected in parallel with the circuit to be measured. We do not want the voltmeter to load the circuit. Consequently an ideal voltmeter will have infinite resistance. An ammeter is connected in series with the circuit to be measured.

Q. Mention the conditions under which charges can move in a conductor. Name the device which is used to maintain this condition in an electric circuit. [2M, 2012]

Ans. Charges can move if there is a difference of electric pressure or potential difference along the conductor. Electric cell or a battery consisting of two or more cells.

[B]

Q. Out of 60 W and 40 W lamps, which one has a higher electrical resistance when in use? [1M, 2008]

Ans. 40 W lamp has a higher electrical resistance when in use.

Q. What happens to the resistance of a conductor when its area of cross section is increased? [1M, 2011]

Ans. Resistance decreases.

Q. A piece of wire of resistance 200 is drawn out so that its length is increased to twice its original length. Calculate the resistance of the wire in the new situation. [2M,2009]

Ans.  $R = \rho \frac{l}{A}$  If the length is increased to twice the original length, keeping the area of cross-section same, then resistance will become double of its original value. So new resistance =  $2 \times 20 = 40 \text{ ohm}$ .

Q. State the factors on which at a given temperature the resistance of a cylindrical conductor depends. State the SI unit of resistivity.

[2M,2012]

Ans. Factors on which the resistance of a cylindrical conductor depends:

- (i) Area of a cross-section of the conductor.
- (ii) Nature of the material.

SI unit of resistivity is ohm metre.

Q. On what factors does the resistance of a conductor depend? [2M,2017]

Ans . The resistance of a conductor depends on the following factors:

- (i) The temperature of the conductor
- (ii) The cross-sectional area of the conductor
- (ii) The length of the conductor
- (iv) Nature of the material of the conductor

Q. (a) List the factors on which the resistance of a conductor in the shape of a wire depends.

(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.

(c) Why are alloys commonly used in electrical heating devices? Give reason. [3M,2018]

Ans. (a) Resistance of conductor depends on following factor :

- (i) Resistance of conductor is directly proportional to length ( $l$ ) of the conductor.
- (ii) Resistance of conductor is inversely proportional to area of cross-section of conductor.
- (iii) Resistance also depends on a material of conductor
- (iv) Resistance and resistivity also depends on temperature.

[C]

Q. Define the SI unit of potential difference. [1M,2017]

Ans. The SI "Unit of potential difference" is Volt. It is "the difference of potential" that would carry "one ampere of current" against one ohm resistance.

Q. What is meant by potential difference between two points? [1M,2011]

Ans. Potential difference between any two points is defined as the amount of work done in moving a unit charge from one point to another.

Q. Name the device that helps to maintain a potential difference across a conductor.

[1M,2016]

Ans . Any source of electricity like battery, cell, power supply, etc. helps to maintain a potential difference across a conductor.

Q. Mention the conditions under which charges can move in a conductor. Name the device which is used to maintain this condition in an electric circuit. [2M,2012]

Ans . Charges can move if there is a difference of electric pressure or potential difference along the conductor. Electric cell or a battery consisting of two or more cells.

[D]

Q. Name the physical quantity which is the same in all the resistors when they are connected in series. [1M,2011]

Ans. Current is the physical quantity.

Q. State in brief the meaning of an electric current. [1M,2011]

Ans. Electric current is defined as the rate of flow of negative charges of the conductor. In other words, the continuous flow of electrons in an electric circuit is called an electric current. The conducting material consists of a large number of free electrons which move from one atom to the other at random.

Q. The resistance of a resistor is kept constant and the potential difference across its two ends is decreased to half of its former value. State the change that will occur in the current through it. [1M,2011]

Ans. Current will be half of its former value.

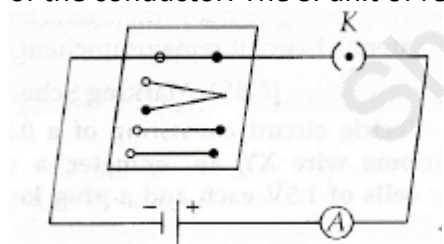
[E]

Q. What is electrical resistivity of a material? What is its unit? Describe an experiment to study the factors on which the resistance of a conducting wire depends. [3M,2017]

Ans- If  $l$  is the length of the conductor,  $A$  its area of the cross-section and  $R$  its total resistance then,

$$R \propto \frac{l}{A} \text{ or } R = P \frac{l}{A}$$

Where  $P$  is a constant of proportionality and is called the electrical resistivity of the material of the conductor. The SI unit of resistivity is Ohm meter.



Now, plug the key. Note the current in the ammeter. Now replace the wire by a thicker nichrome wire, of the same length. A thicker wire has a larger cross sectional area. Again note down the current through the circuit. Instead of taking a nichrome wire, connect a copper wire in the circuit. Again note down the current

Q. Give reasons for the following:

- (i) Why are copper and aluminium wires used as connecting wires?
- (ii) Why is tungsten used for filament of electric lamps?
- (iii) Why is lead-tin alloy used for fuse wires? [3M,2015]

Ans. (i) These are good conductors of electricity.

(ii) Very high melting point and high resistivity.

(ii) Low melting point.

Q. (a) List the factors on which the resistance of a conductor in the shape of a wire depends.  
(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.

(c) Why are alloys commonly used in electrical heating devices? Give reason. [3M,2018]

Ans. (a) Resistance of conductor depends on following factor :

- (i) Resistance of conductor is directly proportional to length ( $l$ ) of the conductor.
- (ii) Resistance of conductor is inversely proportional to area of cross-section of conductor.
- (iii) Resistance also depends on a material of conductor
- (iv) Resistance and resistivity also depends on temperature.

Q. Mention one reason why tungsten is exclusively used for making filaments of electric lamps. [1M,2014]

Ans. Tungsten metal is selected for making filaments of lamp bulbs because tungsten can sustain high temperatures and it has high melting point, combined with the fact that it also has high resistivity.

Q. Why are the coils of electric toasters made of an alloy rather than a pure metal? [2M,2008]

Ans. Resistivity of an alloy is higher than its constituent metal and alloys do not oxidize as easily as constituent metal at high temperature. That is why the coils of electric toasters are made of an alloy rather than a pure metal.

[F]

Q. While studying the dependence of potential difference ( $V$ ) across a resistor on the current ( $I$ ) passing through it, in order to determine the resistance of the resistor, a student took 5 readings for different values of current and plotted a graph between  $V$  and  $I$ . He got a straight line graph passing through the origin. What does the straight line signify? Write the method of determining resistance of the resistor using this graph.

[2M,2019]

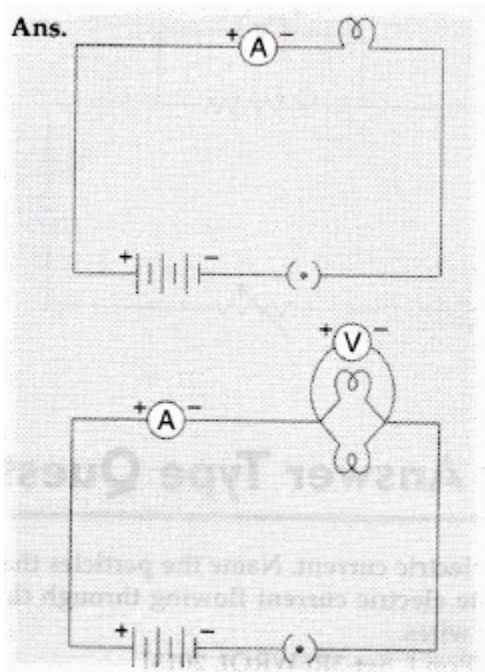
Ans. Straight line signify that the potential difference applied across the resistor is directly proportional to the current flowing through it. To determine the resistance from the graph, read the current value, in amperes corresponding to a given voltmeter reading and take the ratio  $V/I$ . Thus the resistance of conductor is determined in ohms.

[G]

Q. Draw a schematic diagram of an electric circuit comprising of 3 cells and an electric bulb, ammeter, plug key in the ON mode and another with same components but with two bulbs in parallel and a voltmeter across the combination. [2M,2012]

Ans.





[H]

Q. Two resistor, with resistances 50 and 102 respectively are to be connected to a battery of emf 6 V so as to obtain:

(a) How will you connect the resistances in each case?

(i) Minimum current flowing

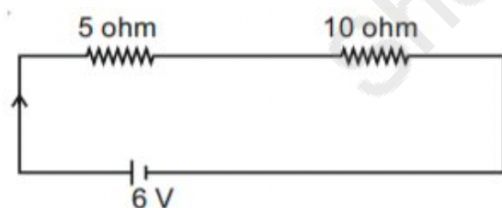
(i) Maximum current flowing

(b) Calculate the strength of the total current in the circuit in the two cases. [3M,2009]

Ans. (a) (i) To obtain the minimum current, the resistances should be connected in series.

(ii) To obtain the maximum current, the resistances should be connected in parallel.

(b) (i) Resistances in series:



Total resistance in the circuit  $R = 5 + 10 = 15 \text{ ohm}$

Current in the circuit  $I = 0.4 \text{ A}$

(ii) Resistances in parallel:

Total resistance in the circuit

$R = 50/15 = 10/3 \text{ ohm}$

Current in the circuit = 1.8A

Q. Which is the better way to connect lights and other appliances in domestic wiring and why? [3M,2017]

Ans. (i) Parallel connection is a better way to connect lights and other appliances in domestic circuits. It is because

(a) When we connect a number of devices in parallel combination, each device gets the same potential as provided by the battery and it keeps on working even if other devices stop working.

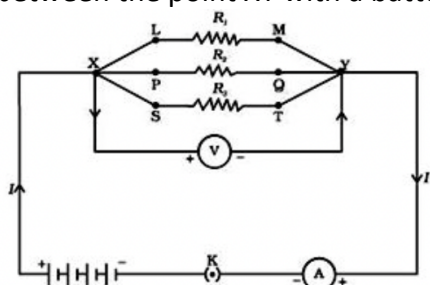
(b) Parallel connection is helpful when each device has different resistances and requires different current for its operation as in this case the current divides itself through different devices unlike series connection.

(ii) Electrician has made series connection of all the lamps in electric circuit of house because of which if one lamp gets fused, all the other lamps stop working.

This is due to the fact that when devices are connected in series then if one device fails, the circuit gets broken and all the devices in that circuit stop working.

Q. Explain with the help of a labelled circuit diagram how you will find the resistance of a combination of three resistor, of resistance  $R_1$ ,  $R_2$  and  $R_3$  joined in parallel. Also mention how you will connect the ammeter and the voltmeter in the circuit when measuring the current in the circuit and the potential difference across one of the three resistors of the combination. [3M,2010]

Ans. Parallel Combination: Connect the three given resistor  $R_1$ ,  $R_2$  and  $R_3$  in parallel between the point XY with a battery, a plug key and ammeter in series as shown in figure.



Connect voltmeter in parallel with these resistors between the terminals X and Y. Close the key and note the ammeter and voltmeter reading.

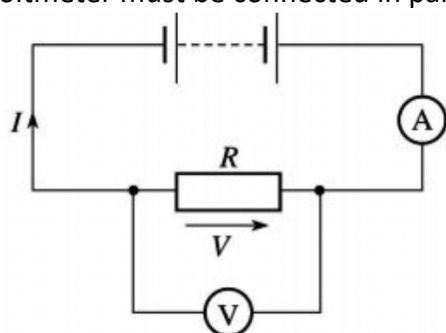
Ammeter

shows the total current drawn by the parallel combination of these resistors while voltmeter shows the voltage applied across the combination. Using Ohm's law, find the equivalent resistance of the combination, i.e. equivalent resistance,  $R = \text{Voltmeter reading} / \text{Ammeter reading}$  Thus, in parallel circuit,

$$I = I_1 + I_2 + I_3$$

$$V/R_p = V/R_1 + V/R_2 + V/R_3 \Rightarrow 1/R_p = 1/R_1 + 1/R_2 + 1/R_3$$

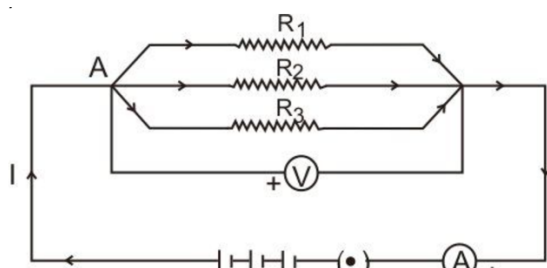
To find the current flow through any one of the resistor, ammeter will be connected in series with that resistor and to measure the potential difference across that resistor, voltmeter must be connected in parallel with that resistor as shown.



Q. (a) With the help of a suitable circuit diagram prove that the reciprocal of the equivalent resistance of a group of resistances joined in parallel is equal to the sum of the reciprocals of the individual resistances.

(b) In an electric circuit two resistors of 12 each are joined in parallel to a 6 V battery. Find the current drawn from the battery. [5M,2019]

Ans-



The potential difference across each of the resistor is same as the applied voltage, but the value of current across each resistor is different. Let  $I_1$ ,  $I_2$ ,  $I_3$  be the current flowing through  $R_1$ ,  $R_2$  and  $R_3$  respectively.

$$I = I_1 + I_2 + I_3 \quad (i)$$

Let the effective resistance of this parallel combination be  $R_p$ , then using, Ohm's law

$$I = V/R_p$$

As  $V$  is same for all resistor, therefore

$$I_1 = V/R_1, I_2 = V/R_2, I_3 = V/R_3 \quad \dots (iii)$$

Hence, from equations (i), (ii) and (iii), we get

$$\frac{V}{R_p} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3} = V \left( \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \right)$$

$$\boxed{\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}}$$

i.e., the reciprocal of effective resistance in parallel combination is equal to the sum of reciprocals of all the individual resistances.

(b)

$$\therefore \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\frac{1}{R_{eq}} = \frac{1}{12} + \frac{1}{12} = \frac{2}{12}$$

$$R_{eq} = 6 \, \Omega$$

$$\therefore I = \frac{V}{R_{eq}}$$

$$I = \frac{6}{6} = 1 \, A$$

[1]

Q. (a) Write Joule's law of heating.

(b) Two lamps, one rated 100 W; 220 V, and the other 60 W; 220 V, are connected in parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 220 V. [3M,2018]

Ans. (a) Joule's law of heating  $H = i^2 R t$  When electric current flows through resistance element, the flowing charges suffer resistance, the work done to overcome resistance is converted to heat energy.

(b)  $P_1 = 100 \text{ W}$ ,  $V_1 = 220 \text{ V}$

$P_2 = 60 \text{ W}$ ,  $V_2 = 220 \text{ V}$

$P = VI$

$i_1 = P_1/V_1 = 0.45 \text{ A}$

$i_2 = P_2/V_2 = 0.27 \text{ A}$

(b) Metals have more free electrons than glass to carry currents. That's why glass is bad conductor and metals are good conductors.

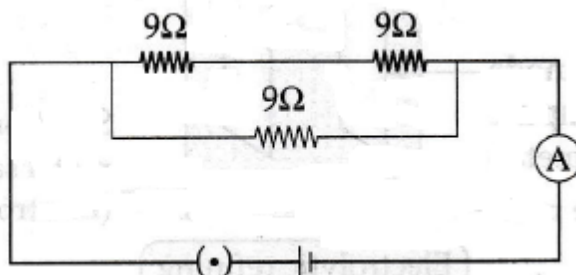
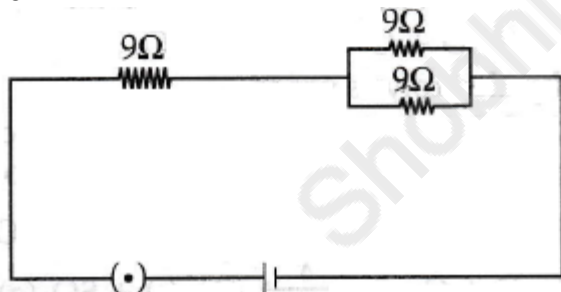
(c) Alloys are used rather than pure metals in electrical heating devices, since they have low electrical conductivity and also low melting point.

Q. Show how would you join three resistors, each of resistance 9 so that the equivalent resistance of the combination is

(i) 13.5

(ii) 6

[3M,2018]



Q. Derive the expression for the heat produced due to a current ' $I$ ' flowing for a time interval ' $t$ ' through a resistor ' $R$ ' having a potential difference ' $V$ ' across its ends. With which name is the relation known? How much heat will an instrument of 12 W produce in one minute if it is connected to a battery of 12 V? [5M,2010]

Ans. Let us take a resistor of resistance  $R$ . Let the current flowing through this resistor be equal to  $I$  and the potential difference across it be equal to  $V$ .

Suppose in time  $t$ ,  $Q$  amount of charge flows through the resistor.

Work done in moving this charge,

$$W = VQ \dots (i)$$

According to the definition of electric current,  $I = Q/t$

$$Q = It$$

Putting this in equation (i),

$$W = VIt$$

This work done is dissipated as heat.

$$\text{Hence, heat produced, } H = W = VIt \dots (ii)$$

According to Ohm's law,  $V = IR$ . Putting this in equation (ii),

$$H = IR \times It = I^2Rt$$

This relation is known as Joule's law of heating

Numerical

Power,  $P = 12 \text{ W}$

Potential difference,  $V = 12 \text{ volt}$

Time duration,  $t = 1 \text{ min}$

$$P = H/t$$

$$H = P \times t = 12 \text{ W} \times 60 \text{ s} = 720 \text{ J}$$

dhle.in

The heat generated by the instrument is 720 J.

[J]

Q. What is an electric fuse? Why is it used in electric circuits? Should it be placed on a neutral wire or a live wire? Justify your answer. [3M]

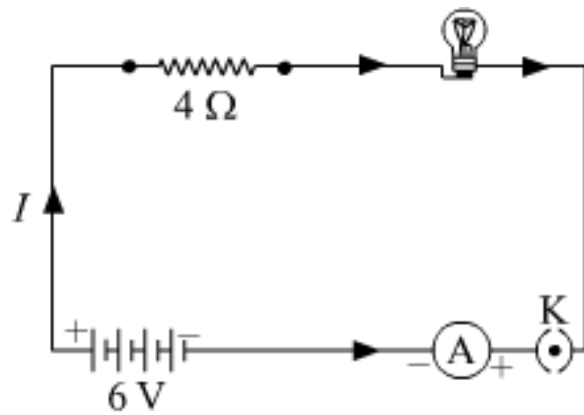
Ans. An electric fuse is a safety device which is used to limit the current in an electric circuit. The use of a fuse safeguards the current and the appliance connected in the circuit from being damaged.

The fuse wire is always connected in the live wire before the appliance so that as a current in the circuit exceeds rating of fuse it may melt and break the socket first before the socket reaches the appliance. Thus no current flows in the appliance.

[K]

Q. An electric lamp of resistance 20 and a conductor of resistance 4 are connected to a 6 V battery as shown in the circuit. Calculate :

[5M,2019]



- (a) the total resistance of the circuit,
- (b) the current through the circuit,
- (c) the potential difference across the
  - (i) electric lamp and (ii) conductor, and
- (d) power of the lamp.

Ans. (a) Here conductor and lamp are in series

$$R_{eq} = R_1 + R_2$$

$$R_{eq} = 4 + 20 = 24$$

$$(b) I = V/R_{eq}$$

$$I = 6/24 = 0.25A$$

(c) (i) Potential difference across the electric lamp

$$V = IR$$

$$V_L = 0.25 \times 20$$

$$V_L = 5\text{ V}$$

Potential difference across the conductor

$$V_c = IR_c$$

$$V_c = 0.25 \times 4$$

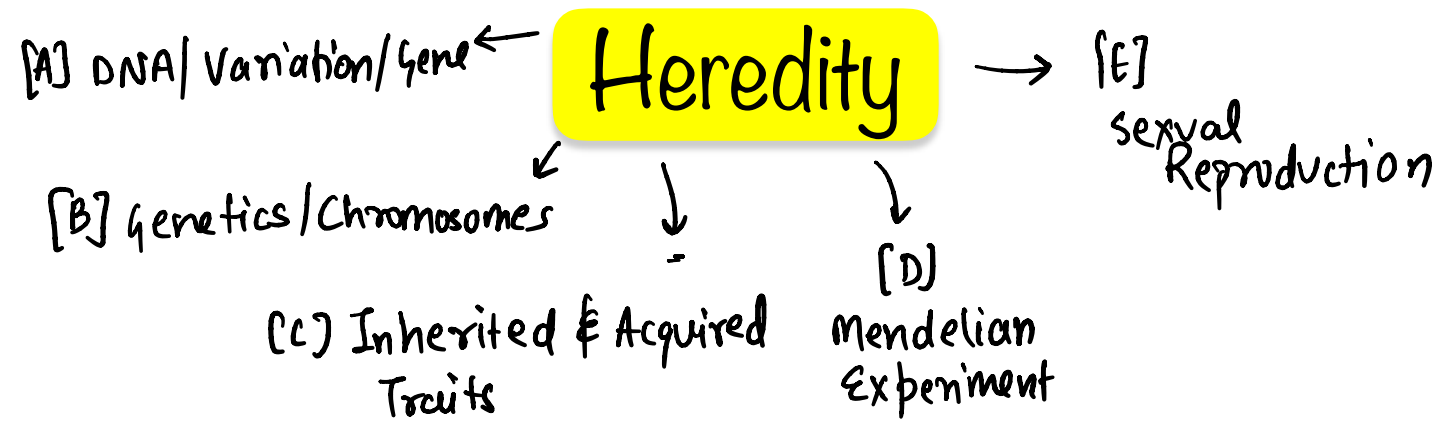
$$V_c = 1\text{ V}$$

(d) Power of the lamp

$$\therefore P = \frac{V_L^2}{R_L}$$

$$P = \frac{(5)^2}{20} = \frac{25}{20}$$

$$P = 1.25\text{ W}$$



[A]

Q. Why is variation important for a species? [1M,2017]

Ans. Variation increases the chances of survival of a species in a constantly changing environment.

Q. What is a gene? [1M,2014]

Ans. Gene, unit of hereditary information that occupies a fixed position (locus) on a chromosome. Genes achieve their effects by directing the synthesis of proteins.

Q. Where is DNA found in a cell? [1M,2015]

Ans. DNA is found in the nucleus of a cell. Inside the nucleus, there are thread-like structures called chromatin fibres (or chromosomes) which contain the DNA (deoxyribonucleic acid) of an organism. In eukaryotic cells, the DNA is contained in the chromosomes present in the nucleus.

Q. Name the information source for making proteins in the cells. [1M,2017]

Ans. The information source for making proteins in the cells is DNA which is DeoxyriboNucleic Acid.

Q. How do genes control traits? [1M, 2017]

Ans. The genes control the characteristic by making a specific protein. Genes are the segment of DNA that contains information to form RNA which ultimately forms protein. Each gene contains two alleles and this instructs the cell to make protein for expression of traits.

Q. Where are the genes located? What is the chemical nature of genes? [2M,2018]

Ans. Genes are located on chromosomes in linear sequence and at fixed positions. Chemically genes are made up of nuclei acids which constitute DNA.

Q. Organisms showing asexual reproduction show very little variation from each other. Why? [2M, 2015]

Ans. In asexually reproducing organisms, there is no meeting of genes of two different individuals since only one partner is involved. There are very minor variations generated in such organisms due to small inaccuracies in DNA copying.

Q. What is DNA copying? State its importance. [3M,2015]

Ans . DNA copying or DNA replication refers to copying of parents traits and genes and passing them to the next generation. Importance of DNA replication

- a) Characteristics of parent organisms are transmitted to its offsprings.
- b) Also some variations are produced that increases the rate of survival of species.
- c) This also forms the basis of evolution.

Q. No two individuals are absolutely alike in population. Why? [1M,2016]

Ans. No two individuals in the population are absolutely alike as there are variation in the DNA due to the Crossing-over and Recombination during the DNA copying process.

**[B]**

Q. How many pairs of chromosomes are present in human beings? [1M,2015]

Ans. 23 pairs of chromosomes are present in human beings.

Q Why will each gamete contain only one gene set? [2M, 2014]

Ans. The genes controlling a particular trait separate from each other during gamete formation. Hence gamete is always pure as far as contrasting characters are considered and will possess only one gene set.

Q. What are chromosomes? Explain how in sexually reproducing organisms the number of chromosomes in the progeny is maintained. [3M,2015]

Ans. Chromosomes are thread-like structures found in the nucleus at the time of cell division. They are made of proteins and DNA. In sexually reproducing organisms, the gametes undergo meiosis, and hence, each gamete contains only half a set of chromosomes. When two gametes fuse, the zygote formed contains the full set of chromosomes. Hence, the formation of gametes by meiosis helps to maintain the number of chromosomes in the progeny.

**[C]**

Q. Give one example each of characters that are inherited and the ones that are acquired in humans. Mention the difference between the inherited and the acquired characters.

[2M,2010]

Ans . Example of inherited trait Shape of the eye or hair colour. Example of acquired trait Building of muscles while exercising.

Difference between inherited and acquired trait is as follows:

<b>Inherited Characters</b>	<b>Acquired Characters</b>
Inherited characters affect the DNA of germ cells and hence can be passed on to the future generations.	Acquired characters do not cause changes in DNA of the germ cells and hence cannot be passed on to the future generations.

Q. Why are traits acquired during lifetime of an individual not inherited? [2M,2016]

Ans. Traits inherited during a lifetime cannot be inherited in the successive generation as the changes do not reflect in the DNA of the germ cells. For example, a cricket player cannot pass on his skills on to his next generation as the traits acquired during his lifetime are



limited only to non-reproductive cells. However, any mutations in the germ cells can result in the new traits being acquired by the successive generation.

Q. 'It is possible that a trait is inherited but may not be expressed.' Give a suitable example to justify this statement. [3M,2015]

Ans. A trait may be inherited, but may not be expressed. This statement is completely justified and can be seen by the following example: If we cross pure-bred tall (dominant) pea plant with pure-bred dwarf (recessive) pea plant we will get pea plants of F<sub>1</sub> generation. If we now self-cross the pea plant of F<sub>1</sub> generation, then we obtain pea plants of F<sub>2</sub> generation. Dwarf plants are not found in F<sub>1</sub> generation but appeared in F<sub>2</sub> generation. In the F<sub>1</sub> generation, the dominant characteristic is Tall which appeared in F<sub>1</sub> progeny but in F<sub>2</sub> generation, presence of two recessive characteristics/ traits, the plants which appeared are dwarf. The ratio of tall plants to dwarf plants in F<sub>2</sub> generation is: 3:1 It proved that dwarfness which was lost in F<sub>1</sub> generation. reappeared in F<sub>2</sub> generation.

Q. Give the basic features of the mechanism of inheritance. [3M,2017]

Ans. The process of transfer of genetical characters from parents to offsprings is called Inheritance. The basic features of inheritance are

- (i) Characters are controlled by genes.
- (ii) Each gene controls one character.
- (iii) There may be two or more forms of the gene.
- (iv) One form may be dominant over the other.
- (v) Genes are present on chromosomes.
- (vi) An individual has two forms of the gene whether similar or dissimilar.
- (vii) The two forms separate at the time of gamete formation.
- (vi) The two forms are brought together in the zygote.

Q. With the help of one example for each, distinguish between the acquired traits and the inherited traits. Why are the traits/experiences acquired during the entire lifetime of an individual not inherited in the next generation? Explain the reason of this fact with an example. [5M,2017]

Inherited Characters	Acquired Characters
Inherited characters are passed from one generation to another.	Acquired characters do not pass from one generation to another.
These traits are caused due to changes in genes or DNA.	These traits are developed in the response to an environment or lifestyle.
<b>Examples:</b> Colour of an eye, natural hair color, natural hair texture, etc.	<b>Examples:</b> Bodyweight, muscle strength, etc.

The inherited characters are passed from one generation to another as these characters/traits/changes are linked with DNA. Thus, these characters are passed from parent to offspring and remain with an individual for a lifetime.

Acquired characters are acquired by an organism during his lifetime, based on lifestyle.

For example, if a person got naturally curly hair and a good muscle physique, then the texture of hair is inherited to his son as it is an inherited trait, but his son doesn't get the same muscle physique as it is an acquired trait.

His son has to work hard to develop same muscle physique as this trait is not linked with DNA.

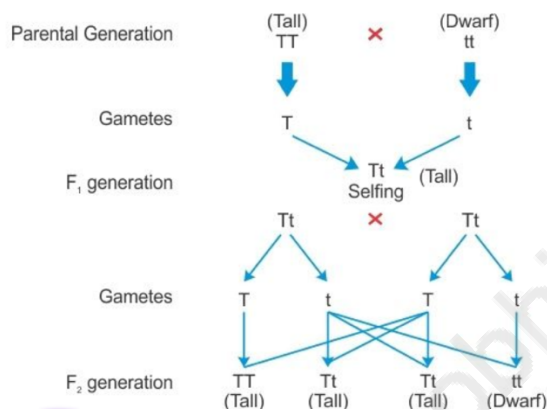
**[D]**

Q. A Mendelian experiment consisted of breeding pea plants bearing violet flowers with pea plants bearing white flowers. What will be the result in F<sub>1</sub> progeny? [2M,2018]

Ans. In Mendelian experiment, breeding of pea plants bearing violet flowers with pea plant bearing white flower leads to production of all violet coloured flowers (F<sub>1</sub> progeny plants). The plants bearing violet coloured of the flower is dominant over white coloured flower in pea plant.

Q. How did Mendel's explain that it is possible that a trait is inherited but not expressed in an organism? [3M,2017]

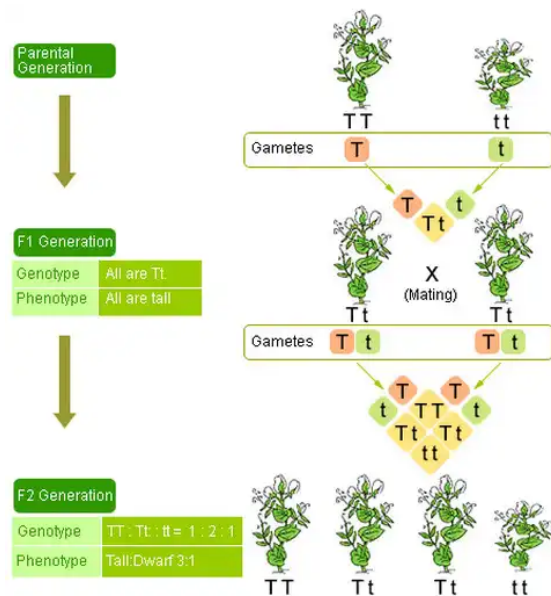
Ans. Mendel explained that it is possible that a trait is inherited but not expressed in an organism with the help of a monohybrid cross.



1. He crossed pure-bred tall plants (TT) with pure-bred dwarf plants (tt).
2. The progeny he received in the first filial generation was tall. The dwarfness did not show up in the F<sub>1</sub> generation.
3. He then crossed the tall pea plants of the F<sub>1</sub> generation and found that the dwarf plants were obtained in the second generation. He obtained three tall plants and one dwarf plant.

Q. Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F<sub>1</sub> and F<sub>2</sub> generations when he crossed the tall and short plants? Write the ratio he obtained in F<sub>2</sub> generation plants. [3M,2019]

Ans. Organisms used by Mendel for his experiments was pea plant. Mendel took a pure tall plant (TT) and crossed it with a dwarf (tt) plant. The progeny thus obtained was called F<sub>1</sub> progeny (First filial progeny). Then he self pollinated the F<sub>1</sub> progeny to obtain F<sub>2</sub> generation. In F<sub>2</sub> generation he found that 75% plants were tall and 25% were dwarf.



Q. How do Mendel's experiments show that the

(a) Traits may be dominant or recessive

(b) Traits are inherited independently

Ans . (a) Dominant genes are the genes that are expressed in offsprings whether they are present in a heterozygous form ( $Tt$ ) or homozygous ( $TT$ ) form.

The gene that is responsible for the functionality of an organism in the presence of an alternate form of a gene is known as a dominant gene.

The gene that is expressed only in the presence of another identical gene is known as the recessive gene.

In the height of the plant, 'T' denotes tallness and 't' denotes dwarfness of the plant. T is dominant over t in the pea plant.

For example, When the Pure tall pea plant ( $TT$ ) is crossed with the dwarf ( $tt$ ) pea plant, the trait expressed will be  $Tt$ , which will produce a tall pea plant. When this gene is passed from parent to offspring, the traits preserved upon them also pass with it.





(b) Mendel crossed two pea plants differing in contrasting traits of two characters i.e a dihybrid cross.

















He crossed a pea plant having yellow-colored and rounded seeds with another pea plant having green-colored and wrinkled seeds.

The F1 generation has all round and yellow seeds.

In the F2 generation, all the characters are inherited independently. (round yellow, round green, wrinkled yellow, wrinkled green).

F<sub>1</sub> cross  
RrYy × RrYy

 round yellow  
 round green  
 wrinkled yellow  
 wrinkled green

	RY	Ry	rY	ry
RY	RRYY 	RRYy 	RrYY 	RrYy 
Ry	RRYy 	RRyy 	RrYy 	Rryy 
rY	RrYY 	RrYy 	rrYY 	rrYy 
ry	RrYy 	Rryy 	rrYY 	rryy 

[E]

Q. How is the equal genetic contribution of male and female parents ensured in the progeny? [2M]

Ans.

- Equal genetic contribution of male and female parents in the progeny is ensured by the equal inheritance of chromosomes from each parent.
- Human possesses 23 pairs of chromosomes, of which 22 pairs are autosomes and 1 pair is the sex chromosomes. The two sex chromosomes in human are X and Y. Females have 2 X chromosomes and males have a X and Y chromosome.
- During the process of fertilization, a haploid sperm fuses with a haploid ovum to produce a diploid zygote. Zygote receives equal amount of genetic material from each parent and thus, retains the diploid nature of fertilization.

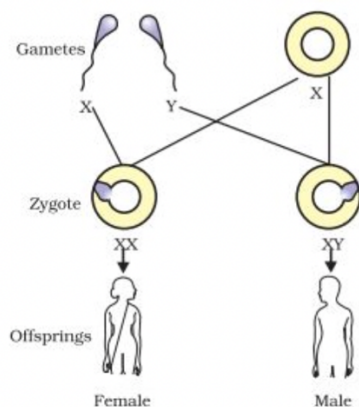
Q. How sex is determined in human beings? [3M,2014]

Ans. Sex of child in humans is determined by the type of male haploid gamete that fuses with the female egg. The chromosome in the 23rd pair of a male gamete can be either X or Y. The female egg always has an X chromosome. So if the male gamete with the X chromosome fuses with the female egg, the child will be female. Similarly if the male gamete with the Y chromosome fuses with the female egg, the child will be male.

Q. Explain with the help of a figure that father is responsible for the sex of a child.

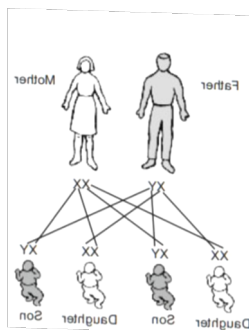
[3M,2015]

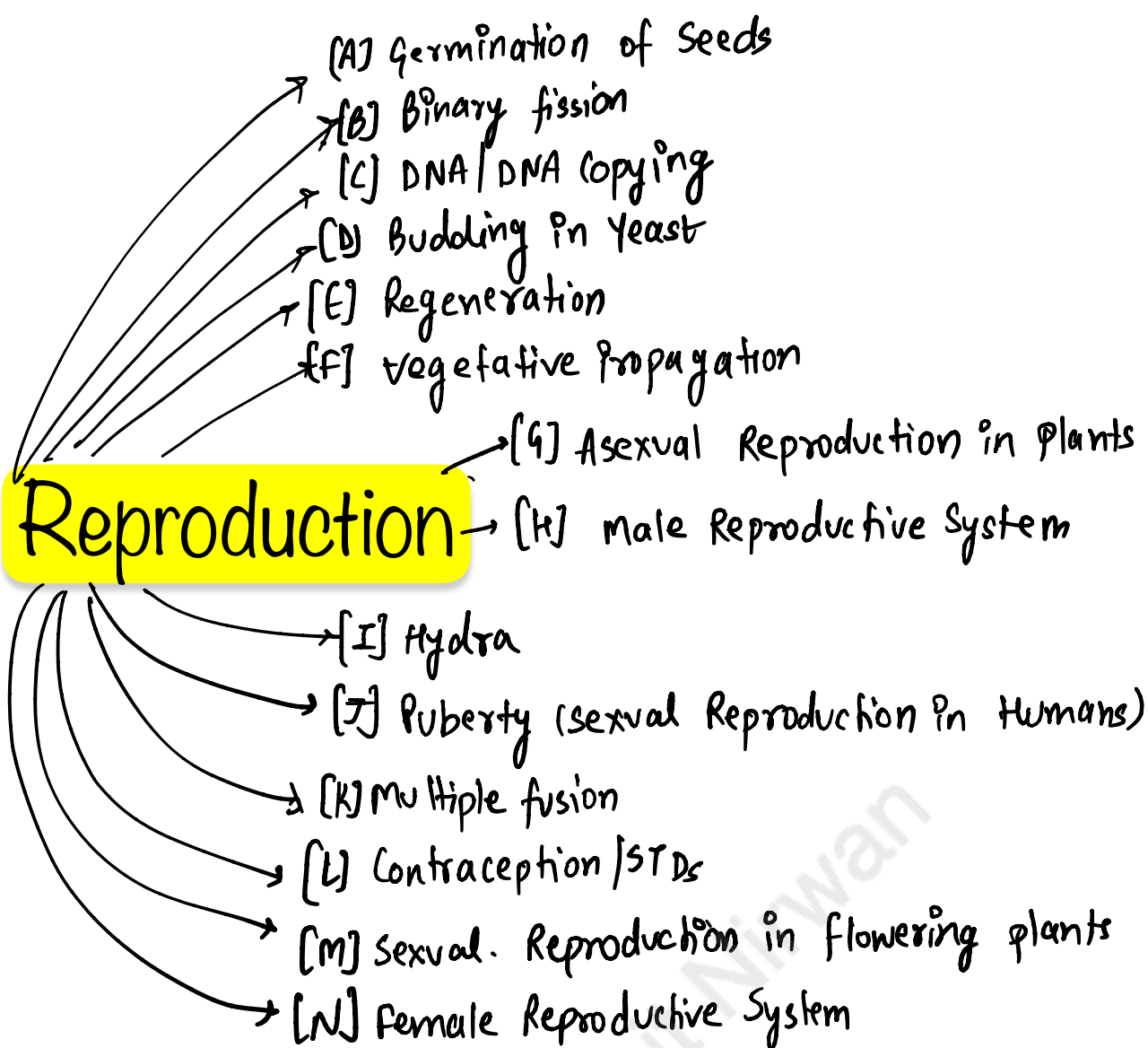
Ans. Sex of a child depends on what happens during fertilization. (i) If a sperm carrying X chromosomes fertilizes an ovum which carries X-chromosome, then the child born will be a girl. (ii) If a sperm carrying Y chromosome fertilizes an ovum which carries X-chromosome, then the child born will be a boy. Thus, sperm (from father) determines the sex of the child.



Q. 'The sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it.' Justify this statement with the help of flow chart showing determination of sex of a newborn. [5M,2012]

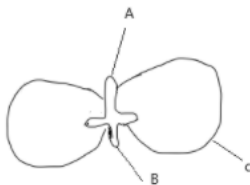
Ans. In human beings, females have two X chromosomes and males have one X and one Y chromosome. Therefore, the females are represented as XX and males as XY. At the time of mating, large number of sperms are ejaculated from the male reproductive organ (penis), into the female reproductive organ i.e., vagina. They travel towards the fallopian tubes, where only one sperm meets with the egg. The process of fusion of the sperm and ovum is called fertilisation. The sperm has either X or Y chromosome and egg has only X chromosome. So, if a sperm carrying Y chromosome fuses with the egg, the newly born child will be male and if a sperm carrying X chromosome fuses with the egg, the newly born child will be female. There is an equal chance of fusion of either X or Y chromosome with the egg so we can say that the sex of a new born child is a matter of chance and none of the parent is responsible for it. Sex determination in humans is show below:





[A]

Q. In the figure, the parts marked A, B and C are sequentially



- (a) Plumule, Cotyledon and Radicle
- (b) Radicle, Cotyledon and Plumule
- (c) Radicle, Plumule and Cotyledon
- (d) Plumule, Radicle and Cotyledon [1M, 2013, 2014]

Ans. (d) In the figure, the part marked A is Plumule, B is Radicle and C is Cotyledon.

[B]

Q. After observing the prepared slides of binary fission in Amoeba and budding in yeast, the following observations were reported :

- a. Single cells of Amoeba and Yeast were undergoing binary fission and budding respectively.
- b. Cytokinesis was observed in the Yeast cell.
- c. Elongated nucleus was dividing to form two daughter nuclei in Amoeba.
- d. A chain of buds were observed due to reproduction in Amoeba.

The correct observation(s) is/are:

- (a) d, a and c
- (b) C and d
- (c) b only
- (d) a and c [1M,2012]

Ans (d)

The correct observations are:

- a. Single cells of Amoeba and Yeast were undergoing binary fission and budding respectively.
- c. Elongated nucleus was dividing to form two daughter nuclei in Amoeba.

Q. A student after observing a slide showing different stages of binary fission in Amoeba draws the following diagrams. However these diagrams are not in proper sequence.



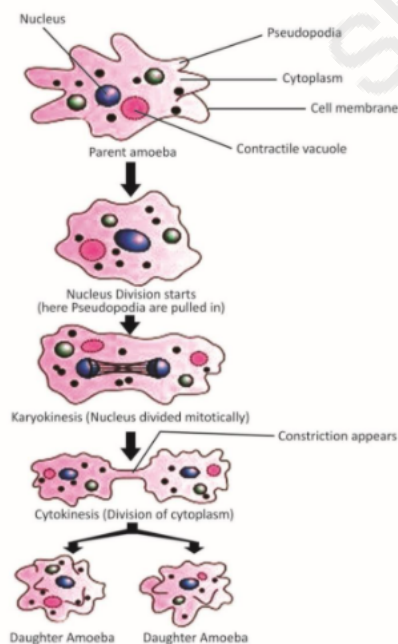
The correct sequence is:

- (a) I, V, IV, III, II
- (b) I, V, III, IV, II
- (c) I, III, IV, V, II
- (d) None of these `

[1M,2011, 2013]

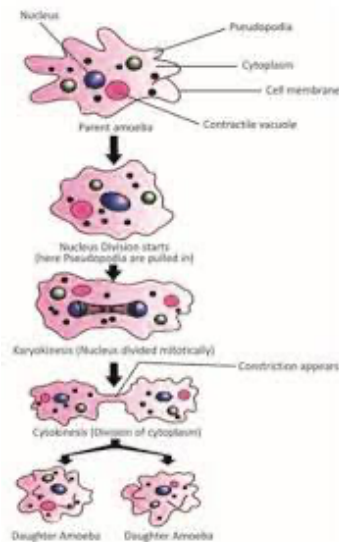
Ans. (d) None of these

Q. With the help of diagrams show the different stages of binary fission in Amoeba.  
[2M,2010, 2017, 2018]



Q. What is binary fission in organisms? With the help of suitable diagrams, describe the mode of reproduction in Amoeba. [5M,2011]

Ans. Binary fission is an asexual method of reproduction. Amoeba reproduces by this method. During this process, nuclear division takes place first, followed by the appearance of a constriction in the cell membrane, which gradually increases inwards and divides the cytoplasm into two parts. Finally, two daughter organisms are formed.



[C]

Q What is the effect of DNA copying which is not perfectly accurate on the reproduction process? [1M,2008]

Ans. Imperfect DNA copying in the reproduction process leads to variations or evolution.

Q. What is DNA? [1M,2016]

Ans. DNA is the information molecule. It stores instructions for making other large molecules, called proteins. These instructions are stored inside each of your cells, distributed among 46 long structures called chromosomes. These chromosomes are made up of thousands of shorter segments of DNA, called genes. Each gene stores the directions for making protein fragments, whole proteins, or multiple specific proteins.

Q. What is the importance of DNA copying in reproduction? [2M,2016]

Ans. DNAs are the carriers of genetic information. For an organism to produce its own kind, it becomes necessary that the offspring get similar DNAs as in parents. DNA replication is the way through which a cell makes additional copies of DNA so that they can be transferred to the offspring. This explains how DNA copying is an essential (i) Regeneration: Ability of organisms to give rise to new individual organisms from their body parts.

(ii) Planaria/Hydra

(iii) Amoeba/Rhizopus/Banana/Sugarcane/any other

(iv) Regeneration is carried out by specialized cells which are not present in non-regenerating organisms.

Q. What is a clone? Why do offsprings formed by asexual reproduction exhibit remarkable similarity? [2M,2017]



Ans. Clone is an organism which is genetically identical with its parent organism. Cloning is an artificial method of asexual reproduction. In case of asexual reproduction, genes are contributed by a single parent. Due to this, offsprings produced by asexual reproduction are clones of their parent.

Q. Why does bread mould grow profusely on a moist slice bread rather than on a dry slice of bread? [2M,2017]

Ans. Moistened bread slice offers both moisture and nutrients to the bread mould, hence it grows profusely. Dry slice of bread offers nutrients but not moisture hence hyphae fail to grow.

Q. What is the effect of DNA copying, which is not perfectly accurate, on the reproduction process? How does the amount of DNA remain constant though each new generation is a combination of DNA copies of two individuals? [3M,2014, 2018]

Ans. The DNA copying which is not perfectly accurate in the reproduction process results in variations in populations for the survival of species. The amount of DNA remains constant because the gametes are special type of cells called reproductive cells which contain only half the amount of DNA as compared to the normal body cells of an organism.

[D]

Q. Select the correct statements for the process of budding in yeast:

- I. A bud arises from a particular region on a parent body.
- II. A parent cell divides into two daughter cells; here the parental identity is lost.
- III. Before detaching from the parent body a bud may form another bud.
- IV. A bud when detached from the parent body grows into a new individual.

(a) II, III and IV

(b) I, II and III

(c) III, IV and

(d) None of the above Dadhle.ir [1M,2013]

Ans. (C) This is the correct sequence of budding in yeast.

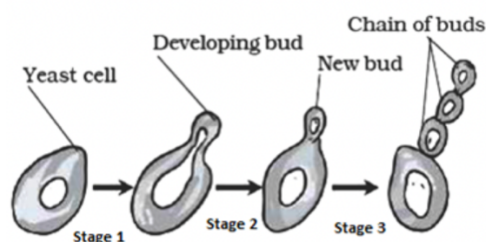
Q. Students were asked to observe the permanent slides showing different stages of budding in yeast under high power of a microscope. [1M,2015]

(a) Which adjustment screw (coarse/fine) were you asked to move to focus the slides?

(b) Draw three diagrams in correct sequence showing budding in yeast.

Ans. (a) A fine screw is used to focus the slides of budding in yeast under high power of a microscope.

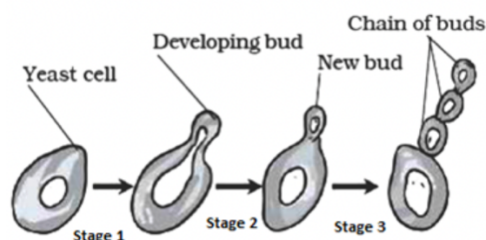
(b)



Q. A student is observing a permanent slide showing sequentially the different stages of asexual reproduction taking place in yeast. Name this process and draw diagrams, of what he observes, in a proper sequence. [2M,2012, 2016]

Ans. Yeast reproduces asexually by the process of budding.

Different stages of budding observed by the student are depicted using a diagram below:



[E]

Q. Name two simple organisms having the ability of regeneration. [1M,2017]

Ans. Hydra and Planaria have the ability of regeneration

Q. What is regeneration? Give one example of an organism that shows this process and one organism that does not. Why does regeneration not occur in the latter? [3M,2017]

Ans. Regeneration: Ability of organisms to give rise to new individual organisms from their body parts.

(i) Planaria/Hydra

(ii) Amoeba/Rhizopus/Banana/Sugarcane/any other.

(iv) Regeneration is carried out by specialized cells which are not present in non-regenerating organisms.

[F]

Q. What is vegetative propagation? [1M,2015]

Ans. Vegetative propagation is an asexual method of plant reproduction that occurs in its leaves, roots and stem. This can occur through fragmentation and regeneration of specific vegetative parts of plants.

Q. List any four reasons for vegetative propagation being practised in the growth of some type of plants. [2M,2011]

Ans. Reasons for vegetative propagation:

(i) It is done for plants which have lost the capacity to produce seeds.

(ii) Vegetative propagation is a cheaper, easier and more rapid method of propagation in plants than growing plants from their seeds.

(iii) Better quality of plants can be maintained by this method.

(iv) It results in propagation of those plants which do not produce viable seeds or produce seeds with prolonged periods of dormancy.

(v) The plants generated from vegetative means are more uniform and genetically similar to the parent stock.

Q. What is vegetative propagation? State two advantages and two disadvantages of this method. [3M,2017]

Ans. Vegetative propagation is a type of reproduction in which several plants are capable of producing naturally through their roots, stems and leaves.

Advantages of vegetative propagation:

Plants not capable of producing sexually are produced by this method. It is a fast and certain method to obtain plants with desired features.

Disadvantages of vegetative propagation:

There is no possibility for variation. The new plant grows in the same area as the parent plant which leads to competition for resources.

[G]

Q. Name the type of reproduction mostly seen in unicellular organisms. [1M,2015]

Ans. Asexual reproduction is the type of reproduction mostly seen in unicellular organisms.

[H]

Q. State the role of i. Seminal vesicle ii. Prostate gland in the human body.

[2M,2011]

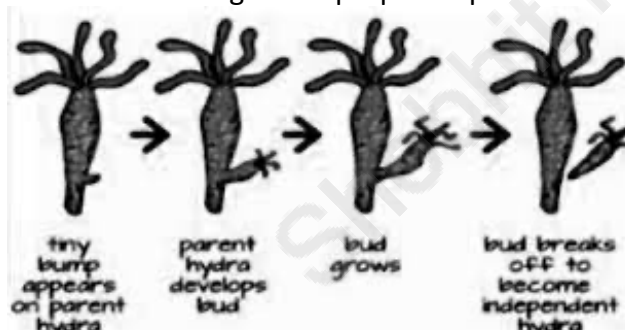
Ans.

i. Seminal vesicles It secrete alkaline secretions which lower the pH of semen and provides nourishment.

ii. Prostate gland It increases the motility of sperms

[I]

Q. Draw a labelled diagram in proper sequence to show budding in Hydra. [2M,2019]



Ans.

[J]

Q. Define the term puberty. List two changes observed in girls at the time of puberty.

[2M,2012]

Ans. The period when the rate of general body growth begins to slow down and reproductive tissues begin to mature is called puberty. Two changes observed in girls at the time of puberty are:

- i. The breast size begin to increase
- ii. Menstruation starts

Q. What is placenta? Describe its structure. State its functions in case of a pregnant human female. [5M,2016]

Ans. The placenta is an organ attached to the lining of the womb during pregnancy.

The placenta is composed of both maternal tissue and tissue derived from the embryo.

It contains blood spaces on the mother's side and villi on the embryo's side.

Functions of the placenta:

- 1 . It provides food and oxygen to the foetus.
2. The foetus gives away waste products and carbon dioxide to the mother's blood for excretion.

Q. (a) Name the human male reproductive organ that produces sperm and also secretes a hormone. Write the functions of the secreted hormone.

(b) Name the parts of the human female reproductive system where

(i) Fertilization takes place

(ii) Implantation of the fertilized egg occurs. Explain how the embryo gets nourishment inside the mother's body. [5M,2015]

Ans. (a) Testes produce sperms and secrete a hormone called testosterone.

The function of testosterone is to control the development of male sex organs and male features such as a deeper voice, moustache, beard and more body hair as compared to females.

(b) i. Fertilisation takes place in the oviduct or fallopian tubes.

ii. Implantation of the fertilised egg occurs in the uterus.

After implantation, a disc-like special tissue called placenta develops between the uterus wall and the embryo. The placenta helps in the exchange of nutrients, oxygen and waste products between the embryo and the mother. Thus, it provides nourishment to the growing embryo.

[K]

Q. What is multiple fission? How does it occur in an organism? Explain briefly. Name one organism which exhibits this type of reproduction. [3M,2016]

Ans. Multiple fission is an asexual reproduction in which parent organism splits to form many new organisms at the same time. Process

a) Sometimes during unfavorable conditions, a protective wall or cyst is formed around the cell of a single celled organism.

b) Inside the cyst, the nucleus of the cell splits several times to form many smaller nuclei called daughter nuclei. Each nucleus gathers a bit of cytoplasm around itself, develops a membrane around each structure.

c) Thus many daughter cells develop which on liberation grow into adult organisms at the same time. Plasmodium is a protozoan which reproduces by asexual method of multiple fission.

[L]

Q. List any four methods of contraception used by humans. State in brief two advantages of adopting such preventive methods. [3M,2015]

Ans. Four methods of contraception used by humans: Intrauterine devices, oral contraceptive methods, surgical methods and natural methods (coitus interruptus) Two advantages of adopting such preventive methods :

i. It helps in preventing unwanted pregnancies.

ii. It reduces the chance of getting STDs such as AIDS.

Q. Explain the meaning of sexually transmitted diseases (STD's). Give two examples of STD's each, caused due to

i. bacterial infection

ii. viral infection.

State in brief how the spread of such diseases may be prevented. [3M,2008, 2012, 2013]

Ans . Sexually transmitted diseases (STD's) are diseases which are usually passed through sexual contact with an infected partner.

i. Sexually transmitted diseases caused due to bacterial infection: Gonorrhea and Syphilis.

ii. Sexually transmitted diseases caused due to viral infection: AIDS and Herpes.

A key strategy in the prevention of STD's involves screening, diagnosis and treatment of patients as well as their sexual partners to interrupt transmission. Prevention of transmission of STD's:

(a) Having sex with an infected or any unknown person should be avoided.

(b) Sharing of needles, syringes etc. must be prohibited.

(c) Surgical and dental instruments should be sterilised properly before use.

(d) Avoid blood transfusion from an infected person. Blood should be tested before transfusion.

(e) Adequate medical treatment should be provided to the pregnant woman to protect the child from getting infected.

Q. List three techniques that have been developed to prevent pregnancy. Which one of these techniques is not meant for males? How does the use of these techniques have a direct impact on the health and prosperity of a family? [3M,2017]

Ans. Techniques to prevent pregnancy:

(a) Coitus interruptus

(b) Barrier methods like use of condoms, cervical cap and diaphragm.

(c) Use of intra-uterine devices such as loop and copper-T

Use of intra-uterine devices is not meant for males.

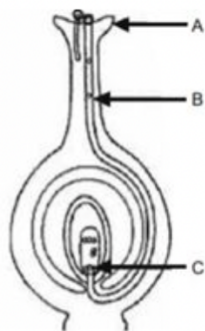
The use of these techniques will keep the mother in good health. With a small family size, parents will be able to provide quality resources to the child such as food, clothes and education. This will improve the overall mental and physical well-being of the family.

**[M]**

Q. (a) Identify A, B and C in the given diagram and write their functions.

(b) Mention the role of gamete and zygote in sexually reproducing organisms.

[5M,2013,2015]



Ans. (a)

A. Stigma.

Function The stigma is a sticky surface where the pollen grains land and germinate.

B. Pollen tube.

Function It carries the pollen grains to the egg cell for fertilisation.

C. Egg cell.

Function It fuses with the male gamete and leads to the formation of the zygote.

(b) Role of gametes Gametes carry the entire genetic information of the organism. These gametes upon fusion result in the formation of the zygote, which develops into a new individual. Any deformation in the gametes will lead to deformity in the newly formed offspring.

Role of zygote- Zygote is the diploid cell formed by the fusion of male and female gametes during fertilisation in sexual reproduction. Zygote is the first stage in the development process of an organism and it contains all the genetic information of both the parents essential for the growth of the new organism.

Q. Define pollination. Explain the different types of pollination. List two agents of pollination? How does suitable pollination lead to fertilization? [5M,2019]

Ans- The process of transfer and deposition of pollen grains from the anther to the stigma of the flower is called pollination.

There are two different types of pollination :

(i) Self pollination It is the process of transfer of pollen grains from the anther to the stigma of the same flower.

(ii) Cross pollination It is the process of transfer of the pollen grains from the anther of one flower to the stigma of another flower. Pollination can be achieved by the agents like wind, water and animals.

After the pollen lands on a suitable stigma, it has to reach the female germ-cells which are in the ovary. For this, a tube grows out of the pollen grain and travels through the style to reach the ovary and then fertilisation occurs.

Q. What is pollination? How does it occur in plants? How does pollination lead to fertilization? Explain. [5M,2013]

Ans. The transfer of pollen from the anther to the stigma of a flower is called pollination. The transfer is accomplished by an external agency such as wind (anemophily), water (hydrophily), insects (entomophily), birds (ornithophily), bats (chiropterophily), etc. Both wind and water are abiotic agencies while insects, birds, bats etc. are biotic agencies of

pollination. After falling on stigma, the pollen grain absorbs water and nutrients. It produces a tube called pollen tube. Pollen tube grows through style and reaches the ovary. Its tip contains a tube nucleus and two male gametes or sperm cells. The advancing pollen tube enters an ovule, generally through micropyle and reaches the interior of the embryo sac. Here the tube bursts to release its two male gametes. One male gamete fuses with the egg to form a zygote and the second male gamete fuses with binucleate central cells which forms endosperm.

**[N]**

Q. (a) Write the functions of each of the following parts in a human female reproductive system:

- (i) Ovary
- (ii) Uterus
- (iii) Fallopian tube

(b) Write the structure and functions of placenta in a human female. [5M, 2017, 2018]

Ans. (i) Ovary : It produces female gametes. One ovum is released by one ovary every month. It also secretes hormones oestrogen and progesterone.

(ii) Uterus: It protects and nourishes the developing embryo.

(iii) Fallopian tube: It passes down the ovum towards the uterus released by the ovary.

Structure of the placenta in human female:

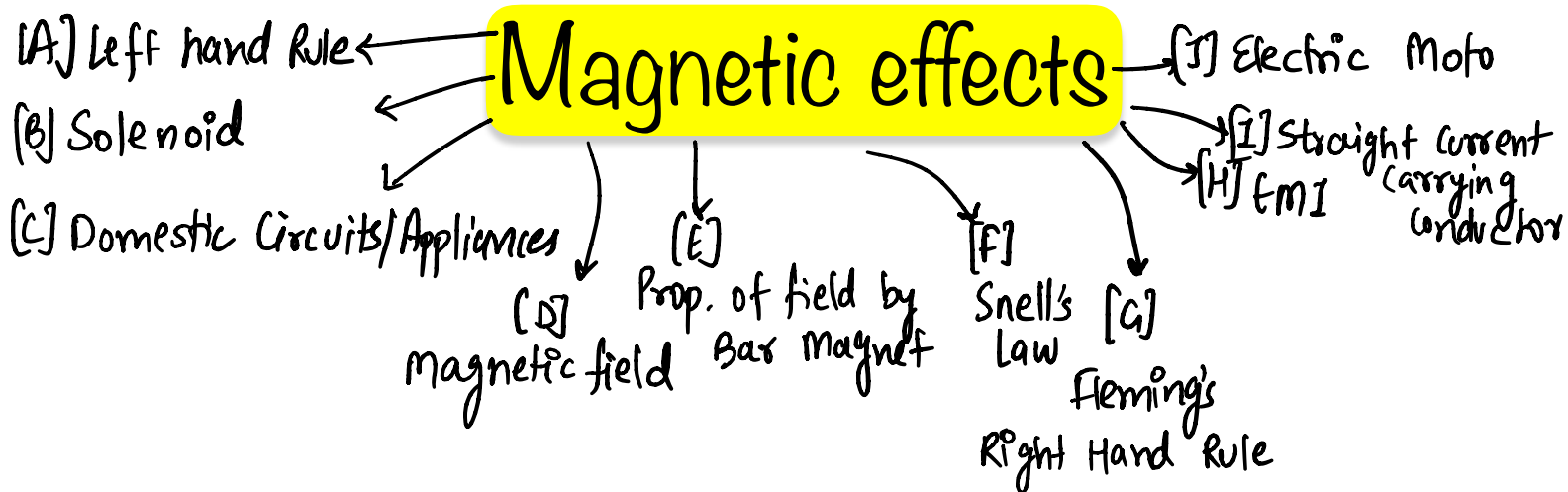
(i) The placenta is a disc which is embedded in the uterine wall.

(ii) It contains villi on the embryo side. The mother's end of the placenta has blood spaces which surround the villi.

Functions of the placenta in human female:

(i) Nutrients and oxygen are received by the foetus from the mother's blood.

(ii) The foetus gives away waste products and carbon dioxide to the mother's blood for excretion.



[A]

Q. Name two electrical appliances of daily-use in which electric motor is used. Name and state the principle on which electric motors work. [3M,2012]

Ans Electrical appliance fan, washing machine

Fleming's Left Hand Rule It states that "Stretch the forefinger, the central finger and the thumb of your left hand mutually perpendicular to each other. If the forefinger shows the direction of the magnetic field and the central finger that of the current then the thumb will point towards the direction of motion of the conductor.

Q. When does short-circuit occur? [2M]

Ans If the insulation of the wires used in the circuit is damaged or the appliance used is faulty due to which the live wire and the neutral wire comes in direct contact as a result current in the circuit rises and the short circuit occurs.

Q. (a) Distinguish between the terms 'overloading' and 'short-circuiting' as used in domestic circuits.

(b) Why are the coils of electric toasters made of any alloy rather than a pure metal? [3M,2008]

Ans (a) Short circuiting When neutral and live wire come in direct contact.

Overloading When too many appliances are connected to a single socket drawing much more current or power than permissible.

(b) Resistivity of an alloy is higher than its constituent metal and alloys do not oxidize as easily as constituent metal at high temperature. That is why the coils of electric toasters are made of an alloy rather than a pure metal.

Q. What is overloading and short circuiting? What is the function of earth wire? [3M,2008]

Ans If too many electrical appliances of high power rating are switched on at the same time, they draw a large current from the circuit. This is called overloading. If the live wire and neutral wire come in contact either directly or via conducting wire, the situation is called



short circuiting. To avoid the risk of electrical shock the metal body of the appliances is earthed.

Earthing means to connect the metal case of the appliance to earth by a means of a metal wire called earth wire.

Q What is the role of fuse, used in series with any electrical appliance? Why should a fuse with defined rating not be replaced by one with a larger rating? [3M,2017]

Ans Fuse is used for protecting appliances due to short-circuiting or overloading. The fuse is rated for a certain maximum current and blows off when a current more than the rated value flows through it. If a fuse is replaced by one with larger ratings, the appliances may get damaged while the protecting fuse does not burn off. This practice of using a fuse of improper rating should always be avoided.

Q. Describe any five safety measures that should be taken while dealing with electrical appliances connected in domestic electric circuit. [5M,2013]

Ans (i) To avoid shocks from electrical appliances, use proper earthing arrangement. (i) Replace old worn out and damaged wires with a new set.

(iii) Put the main switch off when removing any fault in electric circuits.

(iv) Wear rubber shoes and gloves while dealing with replacement of any appliances.

(v) Do not put your hand inside water being heated with an immersion rod, when the rod is inside and on.

[B]

Q. What is solenoid? Mention two ways to increase the strength of the field of a solenoid. [2M,2012]

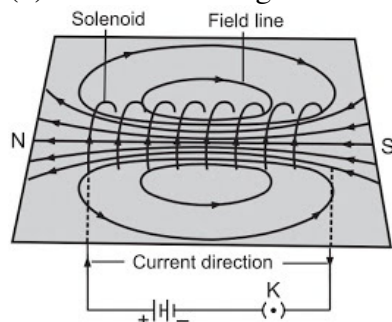
Ans A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid. Two ways to increase the strength of the field of a solenoid (i) By increasing the number of turns. (ii) By increasing current.

Q. (a) What is a solenoid? Draw a sketch of the pattern of field lines of the magnetic field through and around a current carrying solenoid.

(b) Consider a circular loop of wire lying in the plane of the table. Let the current pass through the loop clockwise. Apply the right hand rule to find out the direction of the magnetic field inside and outside the loop. [5M,2009, 2010]

Ans (a) A solenoid is a long coil (shaped like a cylinder) containing a large number of close turns of insulated copper wire. [1]

(b) Direction of magnetic field inside and outside the loop is given as follows:



Q. What is a solenoid? Draw the pattern of magnetic field lines of

(i) A current carrying solenoid and

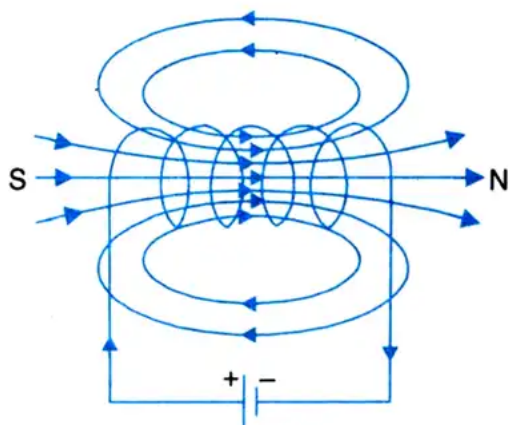
(ii) A bar magnet. List two distinguishing features between the two fields. [5M,2019]

Ans A solenoid is a long cylindrical coil containing a large number of closely spaced turns of insulated copper wire.

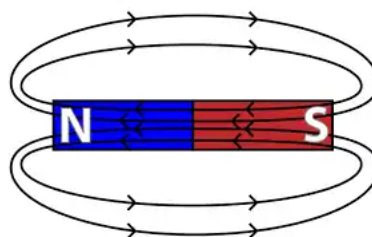
It is a coil containing many circular turns, the wire is wrapped closely in the shape of a cylinder and it is used as an electromagnet.

It also refers to any device that converts electrical energy to mechanical energy using a solenoid. The device creates a magnetic field from electric current and uses the magnetic field to create linear motion.

1. The magnetic field for the current-carrying solenoid



2 For bar magnet.



In above image:-

- 1). The magnetic field for the current carrying solenoid
- 2). For bar magnet.

List of the distinguishing features between the two fields:

- a) The poles of the bar magnet do not lie exactly at the end of the magnet but are somewhat inside. In a solenoid, poles can be considered to be lying at the edge.
- b) The magnetism remains in the bar magnet naturally but in the solenoid, the magnetism is there so long current flows through it.
- c) A magnetic field of a bar magnet emanates from throughout the body of the magnet, with more intensity at the poles. While there is no field emanating from the lateral surface of the solenoid.

[C]

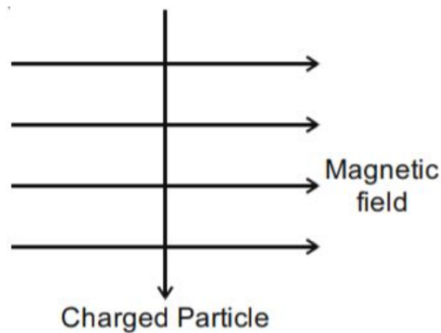
Q. Why is a series arrangement not used for connecting domestic electrical appliances in a circuit? [1M,2008]

Ans A series arrangement is not used for connecting domestic electrical appliances in a circuit because

- (i) Same current flows through each device, but different devices need current of different values to operate.
- (ii) If one device in a series circuit is defective, current is cut off.
- (iii) Total resistance of the circuit increases, so current flowing is reduced.
- (iv) Selective operation of devices is not possible.

[D]

Q. A charged particle enters at right angles into a uniform magnetic field is shown. What should be the nature of charge on the particle if it begins to move in a direction pointing vertically out of the page due to its interaction with the magnetic field? [1M,2010]



Ans Using Fleming's left hand rule we can easily find out that the nature of the charge on the particle is positive.

Q. Define magnetic field of bar magnet. [1M,2015]

Ans Magnetic field around the bar magnet is the region in which magnetic force due to the bar magnet can be experienced. Magnetic field lines start from the north pole and terminates at the south pole outside the magnet.

Q. What is the direction of magnetic field lines inside a bar magnet. [1M,2017]

Ans South pole to north pole.

Q. Define the term 'Induced current'. [1M,2012]

Ans The current induced in a conducting loop that is exposed to a changing magnetic field is known as induced current.

Q. When a current carrying conductor is kept in a magnetic field, state the position when maximum force acts on it. [1M,2014]

Ans The force experienced by a current carrying conductor placed in a magnetic field is the maximum when the conductor is kept perpendicular to the direction of the magnetic field.

Q. List two sources of magnetic fields. [1M,2012]

Ans Permanent magnets, electromagnets

Q. What is meant by the term, 'magnetic field'? Why does a compass needle show deflection when brought near a bar magnet? [2M,2008]

Ans Magnetic field is the region around a magnet in which a magnetic material experiences a force because of that magnet.

The needle of a compass is actually a small bar magnet. So, when a compass is brought near a bar magnet, the compass needle enters the magnetic field of the bar magnet. Therefore, the needle experiences a force because of the bar magnet and gets deflected.

Q. (a) What is a magnetic field? How can the direction of magnetic field lines at a place be determined?

(b) State the rule for the direction of the magnetic field produced around a current carrying conductor. Draw sketch of the pattern of field lines due to a current flowing through a straight conductor. [5M,2009]

Ans (a) Magnetic field is a region near a magnetised body where magnetic forces can be detected.

The direction of the magnetic field line at a place is determined by the direction in which a north pole of the compass needle moves inside it.

(b) Direction of the magnetic field produced around a current carrying conductor is determined by the right hand thumb rule. According to this rule, if we hold a current carrying straight conductor in right hand such that the thumb points @towards the direction of current, then fingers will wrap around the conductor in the direction of the field lines of the magnetic field.

(Draw the diagrams from book)

[E]

Q. Why are magnetic field lines more crowded towards the pole of the magnet?[1M,2016]

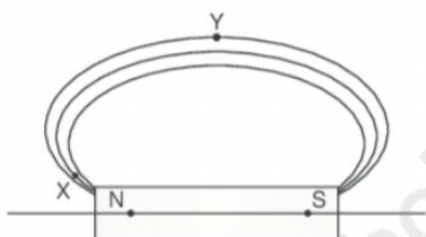
Ans This indicates that the magnetic field in that region is strong.

Q. Why do two magnetic field lines not intersect? [1M,2017]

Ans The two magnetic field lines do not intersect each other because if they do it means at the point of intersect the compass needle is showing two different directions which is not possible.

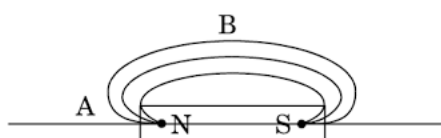
Q. Magnetic field lines are shown in the given diagram. A student makes a statement that magnetic field at X is stronger than at Y. Justify this statement.

Also redraw the diagram and mark the direction of magnetic field lines. [2M,2012]



Ans The relative strength of the magnetic field is shown by the degree of closeness of the field lines. The degree of closeness is more at 'X' than at 'Y'.

∴, The field is stronger at X where the field lines are crowded.



[F]

Q. State the effect of a magnetic field on the path of a moving charged particle. [1M,2012]

Ans It can deflect the path of the charged particle

[G]

Q. Name the physical quantities which are indicated by the direction of the thumb and the forefinger in Fleming's right hand rule. [1M,2012]

Ans In Fleming's Right hand rule, the thumb indicates Motion, the Forefinger indicates Field and middle finger indicates Induced current.

Q. Name and state the rule which determines the direction of magnetic field around a straight current carrying conductor. [2M,2012]

Ans Right Hand Thumb Rule: Imagine holding the current carrying straight conductor in your right hand such that the thumb points towards the direction of current. Then the fingers of right hand wrap around the conductor in the direction of field lines of the magnetic field.

[H]

Q. A coil of insulated wire is connected to a galvanometer. What would be seen if a bar magnet with its north pole towards one face of the coil is

- (i) Moved quickly towards it,
- (ii) Moved quickly away from the coil and
- (iii) Placed near its one face?

Name the phenomena involved. [2M,2010]

Ans (i) A momentary deflection in the galvanometer will be seen, indicating a flow of current in the circuit.

(ii) A momentary deflection in the galvanometer (but in opposite direction) will be seen, indicating a flow of current in the opposite direction in the circuit.

(iii) No deflection in the galvanometer will be seen, indicating that no current flows in the circuit.

The phenomenon involved is electromagnetic induction.

[I]

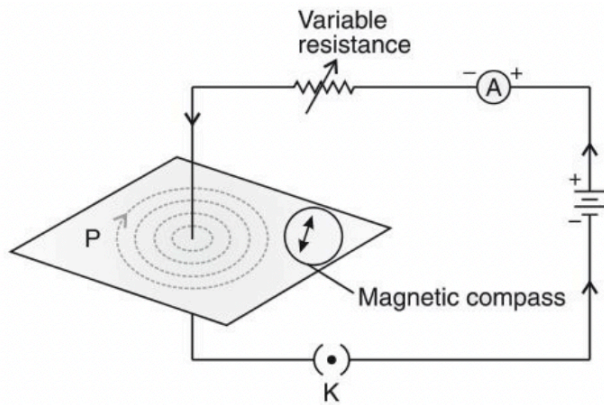
Q. When a current carrying conductor is kept in a magnetic field, it experiences a force. List the factors on which the direction of this force depends. [2M,2013]

Ans When a current-carrying conductor is placed in a magnetic field the wire experiences a force due to the interaction between the field and the magnetic field produced by the moving charges in the wire.

The current carrying conductor generates its own magnetic field around it. This interacts with the external magnetic field. When two magnetic fields interact there will be attraction and repulsion between them based on the direction of the external magnetic field and the direction of the current in the conductor. That is why the conductor experiences a force.

Q. Draw magnetic field lines produced around a current carrying straight conductor passing through cardboard. How will the strength of the magnetic field change, when the point where magnetic field is to be determined is moved away from the straight wire carrying constant current? Justify your answer. [2M,2012]

Ans Using a compass needle. When we move away from the straight wire, the deflection of the needle decreases which implies the strength of the magnetic field decreases.



[J]

Q. (a) State Fleming's left hand rule.

(b) Write the principle of working of an electric motor.

(c) Explain the function of the following parts of an electric motor.

(i) Armature

(ii) Brushes

(iii) Split ring [5M,2018]

Ans (a) Hold the forefinger the centre finger and the thumb of your left hand at right angles to one another. If the forefinger points in the direction of magnetic field, and centre finger points in the direction of current, the thumb gives direction of motion conductor.

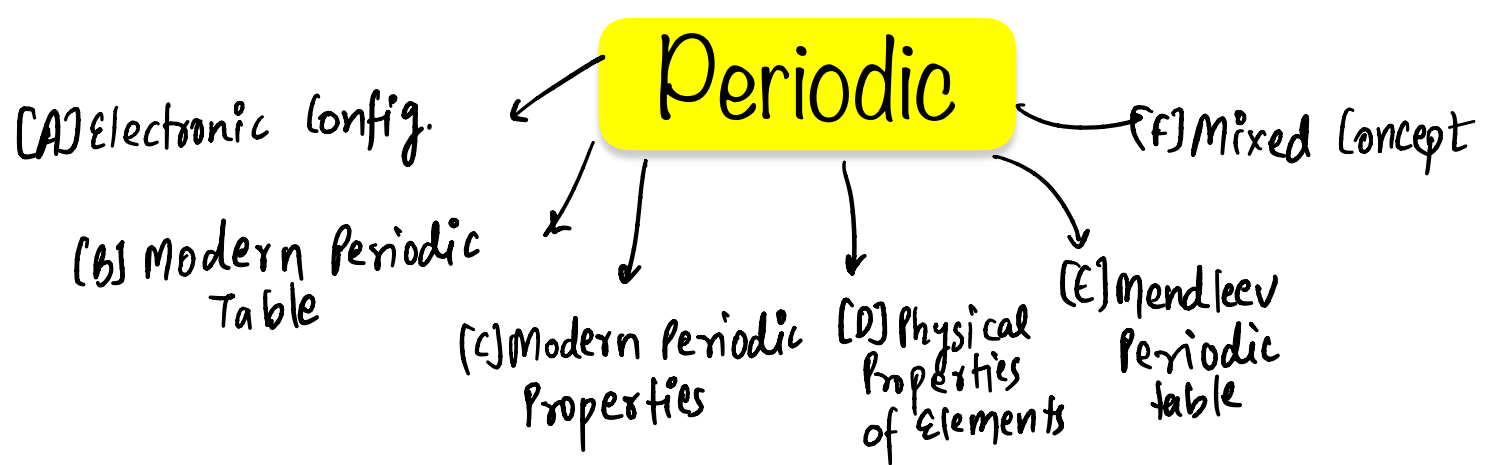
(b) Electric motor is based on the principle that a current carrying conductor placed perpendicular to the magnetic field experience a force.

(c) (i) **Armature**: It contains of a single loop of insulated copper wire in the form of a rectangle.

(ii) **Brushes** : Two carbon brushes B, and B2 press against the commutator.

These brushes act as the contacts between the commutator and the terminals of the battery.

(iii) **Split-ring** : It consists of two halves (R, and R2) of a metallic ring. The two ends of the armature coil are connected to these two halves of the ring. Commutator reverses the direction of current in the armature coil.



[A]

Q The electronic configuration of an element is 2, 8, 4. State its:

- (i) group and period in the Modern Periodic Table.
- (ii) name and write its one physical property. [1M, 2019]

Ans. (i) Group 14 ; Period 3

(ii) Element with electronic configuration 2, 8, 4 is silicon. It is a metalloid as it exhibits properties of both metals and nonmetals.

Q The atomic numbers of three elements A, B and C are 12, 18 and 20 respectively. State, giving reason, which two elements will show similar properties. [1M, 2019]

Ans. The elements are,

A-(atomic number 12) = Magnesium

B-(atomic number 18) = Argon

C-(atomic number 20) = Calcium

Element calcium and magnesium will show similar properties as they belong to the same group (Group II) of the Modern Periodic Table. They have the same number of valence electrons and they both are metals while argon is a noble gas.

Q How can it be proved that the basic structure of the Modern Periodic Table is based on the electronic configuration of atoms of different elements? [2M, 2019]

Ans. Electronic configuration is the distribution of electrons in the shells of an atom. Elements, when arranged in order of increasing atomic number (number of electrons or protons), lead us to the classification known as the Modern Periodic Table. The groups in the Periodic Table signify an identical outer-shell electronic configuration whereas the period indicates the number of shells in which electrons are filled.

Q. An element 'M' has atomic number 12.

- (i) Write its electronic configuration.
- (ii) State the group to which 'M' belongs.
- (iii) Is 'M' a metal or a non-metal?
- (iv) Write the formula of its oxide. [2M, 2012]

Ans. (i) The electronic configuration of M is 2, 8, 2

(ii) M belongs to the 2nd group

(iii) M is a metal

(iv) MO

Q How can the valency of an element be determined if its electronic configuration is known? What will be the valency of an element of atomic number 9? [2M, 2012]

Ans. Valency of an element is determined by the number of electrons in its outermost shell. Hence the number of valence electrons obtained from the electronic configuration of the element gives the valency i.e., the number of electrons lost, gained or shared by the element to attain a noble gas electronic configuration. The valency of an element of atomic number 9 would be 1 since the number of electrons in its outermost shell is 7 so it needs only one electron to attain the noble gas configuration.

Q An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a compound.

(i) Write the position of these elements in the modern periodic table.

(ii) Write the formula of the compound formed. Justify your answer in each case. [3M, 2013]

Ans. (i) Atomic number of X = 17

Electronic configuration of X : 2, 8, 7

Number of electrons in outermost shell = 7

So, group number = 17

Number of shells = 3

So, period number = 3

Atomic number of Y = 20

Electronic configuration of Y: 2, 8, 8, 2

Number of electrons in outermost shell = 2

So, group number = 2, Number of shells = 4

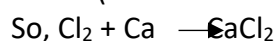
So, period number = 4

(ii) X has 7 valence electrons, so it needs 1 electron to complete its octet and Y has 2 valence electrons, so it can donate its 2 electrons to acquire the octet configuration. Hence, X will gain 1 electron and Y will lose 2 electrons, so the chemical reaction is:



X = Cl (Atomic Number = 17) and

Y = Ca (Atomic number = 20)



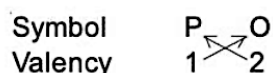
Q Based on the group valency of elements write the molecular formula of the following compounds giving justification for each :

(i) Oxide of first group elements.

(ii) Halide of the elements of group thirteen, and

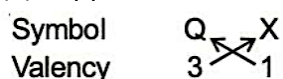
(ii) Compound formed when an element, A of group 2 combines with an element, B of group seventeen. [3M, 2019]

Ans. (i) Suppose first group elements be denoted by P



Formula of oxide of P =  $P_2O$

(ii) Suppose elements of group thirteen be denoted by Q and halogens be denoted by X.





Formula of halide of Q =  $QX_3$   
(iii)

Element	A	B
Valency	2	1

Formula of compound formed when an element, A of group 2 combines with an element, B of group seventeen =  $AB_2$ .

Q. An element 'X' has mass number 35 and number of neutrons 18. Write atomic number and electronic configuration of 'X'. Also write group number, period number and valency of 'X'. [3M, 2016]

Ans. Mass number of X = 35

Number of neutrons = 18

Number of protons = Atomic number = Mass number - Number of neutrons =  $35 - 18 = 17$

Electronic configuration of X = 2, 8, 7

Group number of X = 17

Period number of X = 3

Valency of X = 1.

[B]

Q. How many horizontal rows are there in the Modern Periodic Table and what are they called? [1M, 2013]

Ans. There are 7 horizontal rows in the Modern Periodic Table. They are called periods.

[C]

Q. What do you mean by valency? [1M, 2017]

Ans. The combining capacity of an element is known as valency.

Q. How does the metallic character of elements change along a period of the periodic table from the left to the right and why? [2M, 2011]

Ans. Metallic character decreases from left to right along the period of the Modern Periodic Table because on moving from left to right, size of the atoms decreases and nuclear charge increases. Therefore, the tendency to release electrons decreases. Thus, the electropositive character decreases.

Q. F, Cl and Br are elements each having seven valence electrons. Which of these:

(i) has the largest atomic radius

(ii) is most reactive? Justify your answer stating the reason for each. [3M, 2012]

Ans. (i) Br has the largest atomic radius among all because it uses the largest number of electron energy levels since the valence electrons are placed in larger orbitals.

(ii) Fluorine is the most reactive since it has the greatest tendency to gain electrons because it has a higher effective nuclear charge and less number of energy levels than Br and Cl.

Q. What is periodicity in properties of elements with reference to the Modern Periodic Table? Why do all the elements of the same group have similar properties? How does the

tendency of elements to gain electrons change as we move from left to right in a period? State the reason for this change? [3M, 2017]

Ans. Properties which appear at regular intervals or in which there is gradual variation at regular intervals are called periodic properties, and the phenomenon is known as the periodicity in properties of elements. Elements in the same group or column in the Modern Periodic Table have the same number of electrons in their outermost shell. Hence, elements of the same group have similar properties. On moving across a period from left to right in the Modern Periodic Table, the tendency to gain electrons increases. This is due to an increase in the nuclear pull and a decrease in atomic size.

Q Given below are some elements of the Modern Periodic Table. Atomic number of the element is given in parentheses.

A (4), B (9), C (14), D (19), E (20)

(i) Select the element that has one electron in the outermost shell. Also, write the electronic configuration of this element.

(ii) Which two elements amongst these belong to the same group? Give reasons for your answer.

(iii) Which two elements amongst these belong to the same period? Which one of the two has a bigger atomic radius? [3M, 2015]

Ans. (i) Element D (19) has one electron in its outermost shell. Its electronic configuration is 2, 8, 8, 1.

(ii) Elements A (4) and E (20) both have two electrons in their outermost shells.

Electronic configuration of A: 2, 2

Electronic configuration of E: 2, 8, 8, 2

Since they both have a valency of two, they belong to group 2 of the Modern Periodic Table.

(iii) Elements A (4) and B (9) belong to the second period, and elements D (19) and E (20) belong to the fourth period of the periodic table.

Since the effective nuclear charge increases from left to right in the period, so the atomic radii of the elements decreases.

A (4) has a bigger atomic radius than B (9) and D (19) has a bigger atomic radius than E (20).

Q The elements Be, Mg and Ca each having two electrons in their outermost shells are in periods 2, 3, and 4 respectively of the modern periodic table. Answer the following questions, giving justification in each case:

(i) Write the group to which these elements belong.

(ii) Name the least reactive element.

(iii) Which of these elements has the largest atomic radius. [3M, 2014]

Ans. (i) Elements Be, Mg and Ca belong to Group II.

(ii) Beryllium (Be) is the least reactive element. This is because, as we move down the group, the number of shells increases and the effective nuclear charge decreases. So, the tendency to lose electrons increases.

(iii) Calcium has the largest atomic radius. Since, the number of shells increases down the group, atomic radius also increases.

[D]

Q In the Modern Periodic Table, the element calcium (atomic number = 20) is surrounded by elements with atomic numbers 12, 19, 21 and 38. Which of these elements has physical and chemical properties resembling those of calcium and why? [2M, 2011]

Ans. Electronic configuration of Ca is : 2, 8, 8, 2

The physical and chemical properties of elements with atomic number 12 and 38 will resemble those of calcium.

This is because they all belong to the second group and all of them have two electrons in their respective valence shells.

[E]

Q (i) Why did Mendeleev leave gaps in his periodic table?

(ii) State any three limitations of Mendeleev's classification.

(iii) How do electronic configuration of atoms change in a period with increase in atomic number? [5M, 2009]

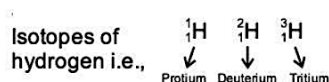
Ans. (i) Mendeleev left some blank spaces or gaps in the periodic table. He also predicted their properties and named them by prefixing eka to the name of the preceding element in the same group.

(ii) Limitation of Mendeleev's Periodic Table:

(a) Anomalous pairs of elements : Co  $\rightarrow$  58.9 (atomic weight) was placed before Ni  $\rightarrow$  58.7 (atomic weight).

(b) Position of elements of group VIII : No fixed position was allotted to them in this periodic table.

(c) Position of isotopes : Mendeleev classified the elements according to atomic masses so all the isotopes of an element should be given different positions but it was not so in Mendeleev's Periodic Table.



(d) Placement of similar elements at different position and dissimilar elements at same position Alkali metals were kept together with coinage metals (Cu, Ag and Au) but similar elements were placed at different positions.

(e) Anomalous position of hydrogen : No specific position was given to hydrogen in this periodic table.

(iii) Each successive period in the Modern Periodic Table is associated with filling up the next shell or energy level. In a period it involves filling of electrons in the same shell but increases by 1 in each case.

Eg. for second period :

K L

${}_3\text{Li} = 2\ 1$

${}_4\text{Be} = 2\ 2$

${}_5\text{B} = 2\ 3$

${}_6\text{C} = 2\ 4$

Q (i) Why do we classify elements?

(ii) What were the two criteria used by Mendeleev in creating his Periodic Table?

(iii) Why did Mendeleev leave some gaps in his Periodic Table?

(iv) In Mendeleev's Periodic Table, why was there no mention of Noble gases like Helium, Neon and Argon?

(v) Would you place the two isotopes of chlorine, Cl-35 and Cl-37 in different slots because of their different atomic masses or in the same slot because their chemical properties are the same? Justify your answer. [5M, 2008]

Ans. (i) We classify elements to systematize their study and make the understanding of properties of elements and compounds simpler.

(ii) Criteria used by Mendeleev:

(a) Atomic mass (b) Properties of hydrides and oxides of elements.

(iii) Mendeleev left some gaps in his Periodic Table to leave scope of search for the undiscovered elements.

(iv) In Mendeleev's Periodic Table, there was no mention of noble gases since they had not been discovered by that time.

(v) The two isotopes of chlorine, Cl-35 and Cl-37 will be placed in the same slot because their chemical properties are the same.

Q On the basis of Mendeleev's Periodic Table given below, answer the questions that follow the table.

Group →	I	II	III	IV	V	VI	VII	VIII		
Oxide Hydride	R <sub>2</sub> O RH	RO RH <sub>2</sub>	R <sub>2</sub> O <sub>3</sub> RH <sub>3</sub>	RO <sub>2</sub> RH <sub>4</sub>	R <sub>2</sub> O <sub>5</sub> RH <sub>5</sub>	RO <sub>3</sub> RH <sub>3</sub>	R <sub>2</sub> O <sub>7</sub> RH	RO <sub>4</sub>		
Group ↓	A	BA	BA	BA	BA	BA	BA	Transition series		
1	H 1.008									
2	Li 6.939	Be 9.012	B 10.81	C 12.011	N 14.007	O 15.999	F 18.998			
3	Na 22.99	Mg 24.31	Al 29.98	Si 28.09	P 30.974	S 32.06	Cl 35.453			
4 First series:	K 39.102	Ca 40.08	Sc 44.96	Ti 47.90	V 50.94	Cr 52.20	Mn 54.94	Fe 55.85	Co 58.93	Ni 58.71
Second series:	Cu 63.54	Zn 65.37	Ga 65.37	Ge 72.59	As 74.92	Se 78.96	Br 79.909			
5 First series:	Rb 85.47	Sr 87.62	Y 44.96	Zr 91.22	Nb 50.94	Mo 52.20	Tc 54.94	Ru 101.07	Rh 102.91	Pd 106.4
Second series:	Ag 107.87	Cd 112.40	In 114.82	Sn 118.69	Sb 74.92	Te 78.96	I 79.909			
6 First series:	Cs 132.90	Ba 137.34	La 138.91	Hf 178.49	Ta 180.95	W 183.85		Os 190.2	Ir 192.2	Pt 195.09
Second series:	Au 196.97	Hg 200.59	Tl 201.37	Pb 207.19	Bi 208.98					

(i) Name the element which is in

(a) 1 st group and 3rd period.

(b) 7th group and 2nd period.

(ii) Suggest the formula for the following

(a) Oxide of nitrogen

(b) Hydride of oxygen

(iii) In group VIII of the Periodic Table, why does cobalt with atomic mass 58.93 appear before nickel having atomic mass 58.71?

(iv) Besides gallium, which two other elements have since been discovered for which Mendeleev had left gaps in his Periodic Table?

(v) Using atomic masses of Li, Na and K, find the average atomic mass of Li and K and compare it with the atomic mass of Na. State the conclusion drawn from this activity.  
[5M, 2008]

Ans. (i) (a) Sodium

(b) Fluorine

(ii) (a)  $\text{N}_2\text{O}_5$

(b)  $\text{H}_2\text{O}$

(iii) In group VIII of the Periodic Table, cobalt appears before nickel so that elements with similar chemical properties may fall in the same group.

(iv) Scandium (Sc) and Germanium (Ge)

(v) Atomic mass of lithium = 7

Atomic mass of potassium = 39

So, average of atomic mass =  $(7 + 39)/2 = 23$

Atomic mass of sodium = 23 i.e., both are the same hence we can conclude that the atomic mass of the middle element is the average of the other two elements.

Q (i) Which two criteria did Mendeleev use to classify the elements in his periodic table?

(ii) State Mendeleev's periodic law.

(iii) Why could no fixed position be given to hydrogen in Mendeleev's periodic table?

(iv) How and why does the atomic size vary as you go:

(a) From left to right along a period?

(b) Down a group? [5M, 2009]

Ans. (i) Increasing atomic mass and similarity in chemical properties of elements were the two criteria used by Mendeleev to classify the elements. He took the formulae of the oxides and hydrides formed by the elements as the basis for classification of elements.

(ii) Mendeleev's periodic law states that "the physical and chemical properties of elements are the periodic function of their atomic masses".

(iii) Hydrogen resembles alkali metals in its electronic configuration and halogens as it also exists as a diatomic molecule and combines with metals and nonmetals to form covalent compounds hence it could not be assigned a fixed position in Mendeleev's periodic table.

(iv) (a) Atomic size decreases from left to right in the periodic table due to increase in nuclear charge.

(b) Atomic size increases down the group because new shells are being added as we go down the group.

## [F]

Q. An element 'X' belongs to the 3rd period and group 13 of the Modern Periodic Table.

(i) Determine the valence electrons and the valency of 'X'.

(ii) Molecular formula of the compound formed when 'X' reacts with an element 'Y' (atomic number 8).

(iii) Write the name and formula of the compound formed when 'X' combines with chlorine.

[3M, 2016]

Ans. Period number of element X = 3

Group number of element X = 13

Atomic number of element X = 31

Electronic configuration of element X = 2, 8, 3

(i) Number of valence electrons of X = 3 and valency = 3

(ii) Atomic number of element Y = 8

Electronic configuration of element Y = 2, 6

Valency of element Y = 2

Molecular formula of the compound formed when element 'X' reacts with an element 'Y' is  $X_2Y_3$ :

(iii) Atomic number of Cl = 17

Electronic configuration of Cl = 2, 8, 7

Valency of Cl = 1

Molecular formula of the compound formed when 'X' reacts with an element 'Cl' is  $XCl_3$ .

Q The position of eight elements in the Modern Periodic Table is given below where atomic numbers of elements are given in the parenthesis.

Period No.		
2	Li(3)	Be(4)
3	Na(11)	Mg(12)
4	K(19)	Ca(20)
5	Rb(37)	Sr(38)

(i) Write the electronic configuration of Ca.

(ii) Predict the number of valence electrons in Rb.

(iii) What is the number of shells in Sr?

(iv) Predict whether K is metal or a non-metal.

(v) Which one of these elements has the largest atom in size?

(vi) Arrange Be, Ca, Mg and Rb in the increasing order of the size of their respective atoms. [3M, 2016]

Ans. (i) Electronic configuration of Ca (20): 2, 8, 8, 2

(ii) Rb belongs to Group 1 and all Group 1 elements have one valence electron.

(iii) Sr belongs to period 5, and so, it has five shells.

(iv) K is a metal with electronic configuration 2, 8, 8, 1. So, it will donate its one electron to acquire the noble gas configuration.

(v) The atomic size increases down the group and decreases across a period. So, Rb is the element which has the largest atomic size.

(vi) The order is  $Be < Mg < Ca < Rb$

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Q. (i) The Modern Periodic Table has been evolved through the early attempts of Dobereiner, Newland and Mendeleev. List one advantage and one limitation of all the three attempts.

(ii) Name the scientist who first of all showed that the atomic number of an element is a more fundamental property than its atomic mass.

(iii) State Modern Periodic law. [5M, 2018]

Ans. (i) Dobereiner triad :

Advantage : The three elements of a triad were found to possess similar properties.

Limitation : He classified only nine elements.

Newland's octave :

Advantage : Elements known at that time were arranged in the increasing order of their atomic weights, the properties of every eighth element were similar to those of the first one.

Limitation : This classification did not include elements beyond atomic weight 40 (calcium)

Mendeleev :

Advantage : He classified elements discovered till then and left gaps for the elements to be discovered in future.

Limitation: Position of rare earths was not clear. They were placed in group III A.

(ii) Henry Moseley

(iii) The Modern Periodic Law can be stated as "the physical and chemical properties of the elements are the periodic functions of their atomic numbers."

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